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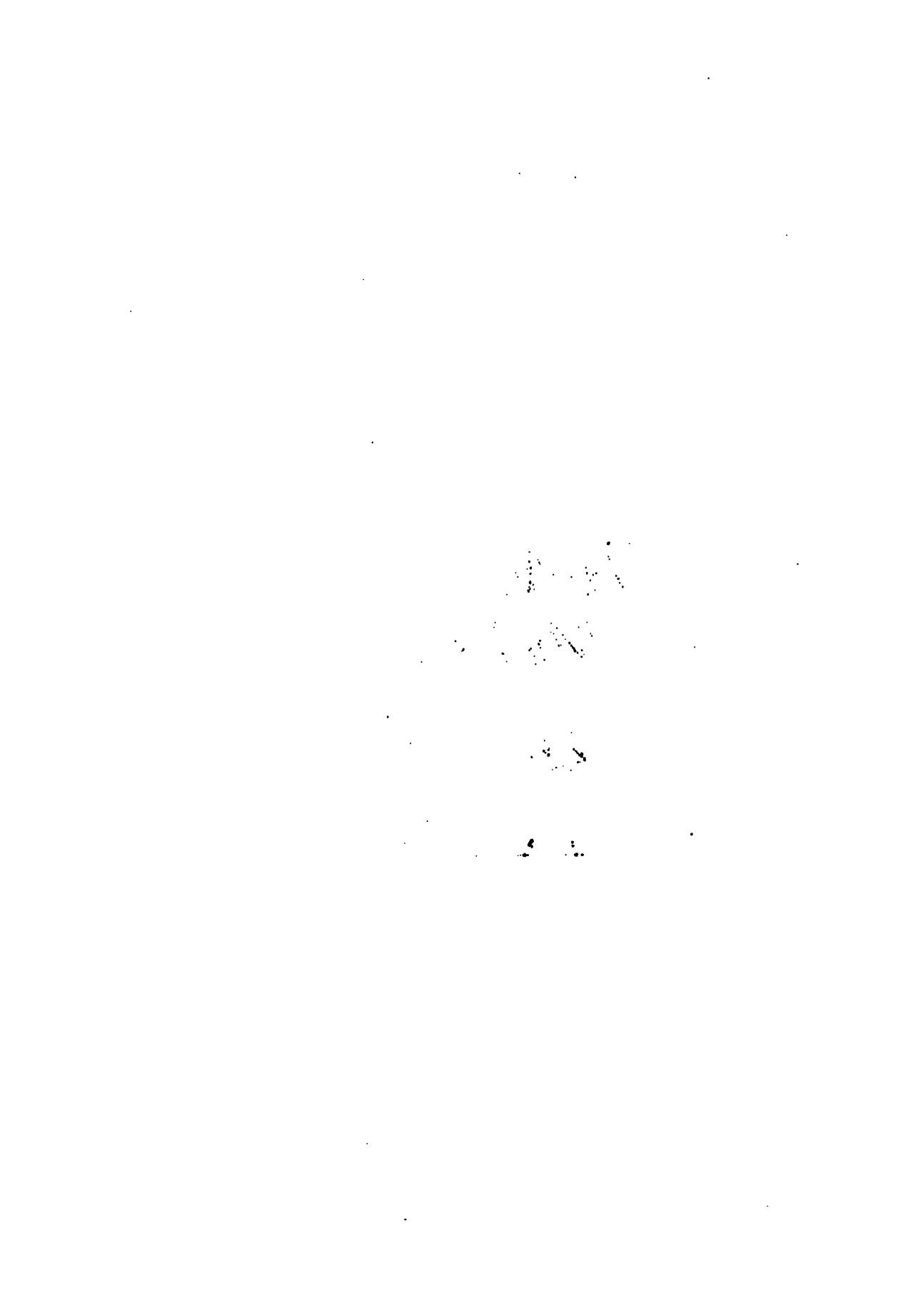
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ANNUAL REPORT

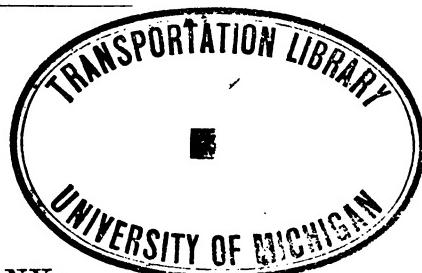
OF THE

CANAL COMMISSIONERS

OF THE

STATE OF NEW YORK

Transmitted to the Legislature January 30, 1871.



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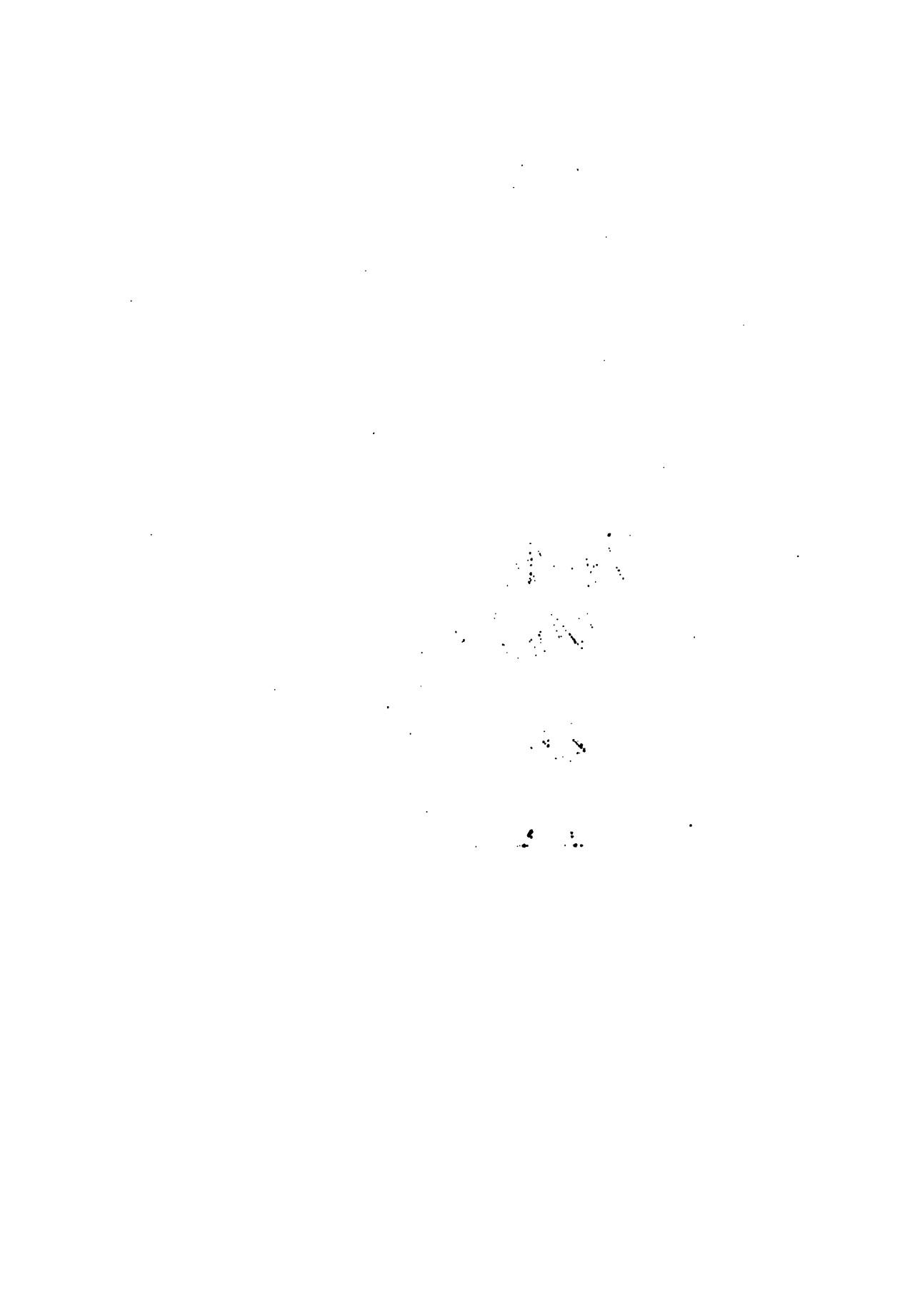
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ANNUAL REPORT.

STATE OF NEW YORK,

CANAL COMMISSIONERS' OFFICE,
ALBANY, January 20, 1871. }

To the Honorable the Legislature of the State of New York:

In pursuance of the provisions of the Revised Statutes, and of chapter 350, Laws of 1847, the Canal Commissioners, in charge of the canals of this State, respectfully submit their

✓ ANNUAL REPORT.

for the fiscal year ending September 30th, 1870.

The Board of Canal Commissioners, on the 1st day of January, 1870, consisted of John D. Fay, William W. Wright, and George W. Chapman.

It was organized by the election of John D. Fay, President, and George W. Chapman, Secretary.

To George W. Chapman was assigned, in special charge, the Eastern Division of the canals, which is made up as follows:

	Miles.
Erie canal, from Albany to east bank of the Oneida Lake canal.	136
Champlain canal.....	66
Glen's Falls feeder.....	12
Pond above Troy dam.....	3
Black River canal and Black River improvement.....	98
 Total	 315

To William W. Wright was assigned, in special charge, the Middle Division of the canals, which embraces the following:

	Miles.
Erie canal, from the east bank of the Oneida Lake canal to the county line between Seneca and Wayne counties, including the several feeders and reservoirs.....	76
Chenango Canal, feeders and reservoirs.....	97

6 ANNUAL REPORT OF THE CANAL COMMISSIONERS.

	Miles.
Chenango Canal extension, now under contract for construction	30
Oswego canal	38
Oneida Lake canal	7
Oneida river improvement	20
Seneca river towing path	$5\frac{1}{4}$
Cayuga and Seneca canal	23
Cayuga inlet	2
Crooked Lake canal	8
Chemung canal	23
Chemung Canal feeder	16
Seneca river improvement	$12\frac{1}{2}$
Total	358

To John D. Fay was assigned, in special charge, the Western Division of canals.

The canals embraced in this division are as follows:

	Miles.
Erie canal, from the east line of Wayne county to Buffalo, including works connected therewith	149
Genesee Valley canal, from Rochester to Olean	107
Extension of said canal from Olean to Millgrove	6
Dansville branch, from Shakers to Dansville	11
Total	273

EASTERN DIVISION.

REPORT OF GEORGE W. CHAPMAN, CANAL COMMISSIONER.

The Commissioner in charge of the Eastern Division of the New York State canals has the honor herewith to submit his first annual report for the fiscal year, ending September 30, 1870.

The Eastern Division comprises that portion of the Erie canal extending from the south end of the Albany basin to the east bank of the Oneida Lake canal at Higginsville, nine miles west of Rome, including also the Champlain canal, extending from Troy to Whitehall and the Black River canal and improvement, extending from Rome to Carthage, together with all feeders, dams, side cuts and reservoirs connected therewith, its aggregate length being three hundred and fifteen miles. It is divided into eleven superintendent or repair sections; the Erie canal into five, and the Champlain and Black River canals each into three.

This division, during the season of 1869, was under charge of the late Hon. Oliver Bascom, up to the 7th of November, when the office became vacant by his death.

The undersigned was appointed by the Governor, on the 11th of November, 1869, to fill the vacancy thus occurring, until the 1st day of January, 1871.

This report will, therefore, in its statements of work done and expenditures made for the fiscal year, beginning October 1, 1869, and ending September 30, 1870, include that portion of the same which occurred up to November 7, 1869, under the charge of the late commissioner.

At that date the entire division was under contracts for ordinary repairs, classified as follows:

ANNUAL REPORT OF THE

REPAIR CONTRACTS.

Commencement of contracts.	Canal and section.	Duration of contract.	Annual compensa- tion.	Names of con- tractors.
Jan. 1, 1867....	Erie No. 1.....	5 years.....	\$70,000	Wm. C. Stephens.
March 1, 1869....	do 2.....	4 10-12 years.....	25,975	S. Donaldson.
March 1, 1868....	do 3.....	4 10-12 years.....	27,000	D. & A. Z. Neff.
May 1, 1869....	do 4.....	4 8-12 years	34,800	C. F. Brannan.
Sept. 15, 1869....	do 5.....	4 years 3 mo. 15 days.....	18,900	P. H. Hosch.
Sept. 15, 1869....	Champlain No. 1.....	4 years 3 mo. 15 days.....	22,470	J. A. Wilson.
March 1, 1868....	do 2.....	4 10-12 years.....	24,900	H. S. Pratt.
Jan. 1, 1867....	do 3.....	5 years.....	17,750	Ryal G. Briggs.
April 1, 1866....	Black Riv. No. 1.....	3½ years.....	16,440	Wm. McArthur.
April 1, 1866....	do 2.....	3½ years.....	7,980	Archibald McArthur.
March 1, 1869....	do 3.....	4 years 10 months.....	7,000	I. J. Wood.

The season of 1869 was a particularly disastrous one to the canals of this division, by reason of the several unprecedented freshets which occurred in that year; that of April 21st, on Black river, involving the loss of the North Branch reservoir, and inflicting great damage to the banks and structures of that canal, occasioned very large expenditures, nearly all of which have been audited and paid during the past fiscal year.

On the 4th of October, 1869, there occurred one of the most extraordinary floods ever known in eastern New York. This was followed, on the 11th, by another, which widened and deepened the breaks made by the former, and greatly increased the damage and the cost of repairs.

The records kept at South Hartford, Washington county, show that $\frac{6}{10}$ ths of an inch of rain fell at that place on the 3d of October, and that the fall of rain on October 4th and 5th was $5\frac{1}{4}$ inches, and for the whole month $13\frac{8}{10}$ inches. At Hudson, 14.40.

The rain which fell in the region of the Champlain canal during the month of October, 1869, was nearly one-third of the average annual fall of rain throughout the country.

The five sections of Erie and the whole of Champlain canals sustained immense damage from a large number of breaks, causing a total suspension of navigation for several weeks. And when, by the energy and efficient management of the late Commissioner in charge, it was at length restored, but a small proportion of the labor had been performed necessary to restore the division to its former condition. In fact, from his laudable anxiety to relieve the business interests, which had suffered so much from this long detention, the levels were filled at the earliest possible moment, although many bars had not been thoroughly cleaned out, and many weak and dangerous points were

temporarily repaired to meet the pressing demands from all parts of the State for an immediate resumption of navigation.

Upon some levels, where large crowds of boats had accumulated, assistance to navigation, by men and teams, was furnished by the late Commissioner, a portion of which force was continued up to the close of the season, and was of great advantage to those using the canals.

On the 21st of April, 1870, another sudden flood from Schoharie creek, which raised the water of the Mohawk below higher than ever known before, caused great damage to the canal at Schoharie creek and at the upper Mohawk aqueduct. The numerous breaks made and walls destroyed were repaired before the opening of navigation, but the work necessarily increased the cost of spring repairs upon these two sections over forty thousand dollars. None of the work done upon these sections during the previous winter was damaged by this freshet.

The break at Whitesboro in May, 1870, was the only break of importance which occurred during the season of navigation in 1870.

From this series of floods the cost of ordinary repairs upon this division has been greatly enhanced. It may be fairly estimated that the floods of 1869, and early in 1870, damaged the canals upon this division to the amount of five hundred thousand dollars, a large proportion of which damage has been repaired, and the cost of the same paid for during the past fiscal year.

On assuming the duties of this office in November, the undersigned, accompanied by the division and resident engineers of this division, and by the present Commissioner in charge of the Middle Division, made a thorough examination and inspection of the canals under his charge, and gave such directions as were deemed necessary to the repair contractor and the superintendents in charge of the sections, for maintaining good navigation and for guarding against further accidents and delays for that season. No important detentions or casualties were experienced up to the 5th of December, when the canals were closed by ice.

After the close of the season the superintendents were called on for a full and detailed report of the condition of their sections, and of the amount of work necessary to be done before the opening of navigation; which reports were duly furnished, showing a large amount of work necessary to be done. After an examination of these reports, and further personal inspection of the most important

points, the repair contractors were notified to furnish and deliver upon their respective sections the estimated amount of stone, lumber and other materials necessary for the ordinary spring repairs, and for permanently repairing the damages caused by the floods of the previous year. Upon sections Nos. 2 and 3, Erie, and No. 1, Champlain, where the greatest damage by the breaks of 4th and 11th of October occurred, the work of repairs was prosecuted vigorously during the winter wherever it was deemed necessary to protect against the usual spring freshets. The amount and character of this work will be found detailed hereafter in the report for each section.

The repair contracts on sections 1 and 2, Black River canal, expired on the first day of January, 1870, since which time the expenditures have been made by the superintendents.

On the 10th day of March, 1870, the Legislature inaugurated a long needed reform in canal management, by the passage of an act to abolish the Contracting Board, and the system of repairing the canals by contract.

Under this law, about the first of April, the repair contracts on this division, upon sections 2, 3, 4 and 5, Erie canal, and sections 1, 2 and 3, Champlain, and No. 3, Black River canal, were surrendered by the contractors and canceled by the Canal Board.

This action, the contracts upon sections 1 and 2, Black River, having previously expired, left the entire division, with the exception of section No. 1, Erie, under the immediate charge of the superintendents appointed by the Canal Board on the 25th of March, 1870.

In my report of the 26th of March, 1870, to the Canal Board, upon the condition of the canals upon this division, it was reported that "all the sections will require large expenditures to be made this spring, in order to maintain the structures, to prepare the canals for the opening of navigation, and to secure a proper depth of water for the coming season."

This report was based upon the

CONDITION OF THE CANALS.

No one can successfully dispute the fact, that the canals of this division were, in the spring of 1870, in a most deplorable condition.

The prism of the canal contained large accumulations of deposits. The banks were low and dangerously weak. The requisite depth of water could not be maintained without the daily risk of breaks. Nearly all the structures were generally dilapidated. The reservoirs,

dams and feeders were, from long neglect, imperiled by every flood. Navigation was a matter of chance rather than of business calculation. The farmer who was entitled to convenient access to his farm, the town whose daily wants required a safe passage over the canal bridges, and the community which claimed protection to its property from leakage and floods, certainly had some rights which the State was bound to respect.

Public sentiment, sound policy, and justice to the forwarding interests of the State, demanded thorough and extensive repairs, and a liberal policy of management that should lessen the time of transit, afford every possible facility for good navigation, and protect the persons and property both of those living along side of and of those using the canals.

With these objects in view, immediately after the first of April the spring repairs were promptly begun and vigorously prosecuted by the efficient superintendents in charge of the sections, to whose untiring labors and faithful discharge of their duties the State is indebted for the successful season of good navigation which followed.

The following is a detailed statement of the objects and amounts of all expenditures on the Eastern Division for the different sections during the fiscal year:

ERIE CANAL.

SECTION No. 1.

WILLIAM J. WHEELER, *Superintendent.*

This section still remains under contract for repairs, made with William C. Stephens (assigned to Thomas Gale) for five years from January 1, 1867, and extends from the south end of Albany basin to the west end of the lower Mohawk aqueduct, including the West Troy and Port Schuyler side cuts; the Champlain canal, from the junction to a point two hundred feet north of the guard lock at Cohoes, on the south side of the Mohawk river; the Troy dam, the sloop lock and the pond above, making nineteen miles.

The structures upon this section are:

Forty-three locks; one hundred and eighty-two lock gates; two weigh locks; two collectors' and weigh offices; one aqueduct (Lower Mohawk); six waste-weirs; sixteen culverts; fourteen farm bridges (wood); six road bridges (wood); eighteen road bridges (iron); three tow-path bridges (iron); two tow-path bridges (wood); two foot bridges (wood); eight lock houses; eighteen watch houses; one

workshop at Cohoes ; two timber sheds ; one dwelling-house at State yard, Cohoes.

During the past fiscal year the following work has been done under extraordinary repairs :

Two iron tow-path and road bridges (one at Oneida street, Cohoes, Champlain canal, and one at south end of Lower Mohawk aqueduct, Erie canal) ; vertical walls have been built from locks Nos. 15 to 18, also at the paper mill and aqueduct. The river dock wall, below upper side cut at West Troy, has been raised ten feet and laid in cement. The contract for removing wall bench and building slope and vertical wall from lock No. 2 to Fort Schuyler has been completed. A new waste-weir has been built south of Dry river, at West Troy, and the Dry river culvert deepened.

The stone dam at Cohoes, now being rebuilt at the termination of section No. 1 Erie, is upon section No. 1 Champlain ; but the accounts in the auditor's office have been charged to No. 1 Erie for the last two years. The extraordinary appropriation was expended in 1869, and the whole amount this year is all chargeable to ordinary repairs. The work is being well done, and will be easily completed next summer.

The following work has been done by the repair contractor:

Thorough and extensive repairs have been made at locks Nos. 3, 4, 12, 14, 15, 16, 17 and 18 ; new piers at locks Nos. 4, 12, 16 and 18 ; new miter sills and fender timber at locks Nos. 3, 13, 14, 15, 16, 17 and 18 ; the bottom at lock No. 16 has been repaired and concreted ; also, the gravel embankments at nearly all the locks have been raised to correspond with the original cross section plan. There have been constructed the past year twenty-three new lock gates : four have been inserted at the sloop lock ; fourteen through the "sixteen locks," and five new, on hand, ready for use when required. Repairs have been made to the remaining lock gates, including those at Albany and West Troy weigh locks ; nearly all the balance beams and the top portion of the lock gates, new and old, on this section, have been painted with two coats of white lead and oil.

The two culverts at Port Schuyler, Benedict's, New York Central and Champlain, have been cleaned out and repaired ; also, suitable channels opened to give a free passage of the water to the river. Extensive repairs have been made to the one located in the city of Albany, and the one leading from the West Troy weigh lock partially repaired.

All the waste-weirs have been overhauled and repaired, and a new bulk-head built at the one near lock No. 18.

The Lower Mohawk aqueduct was damaged by ice during the spring freshets, and has been repaired.

A new stone bridge abutment at Younglove's, Cohoes, and the bridge superstructure at Spring street, West Troy, have been rebuilt. Substantial repairs have been made at the following iron bridges, viz.: Auburn, Union, Canal and Schenectady streets, and Port Schuyler, at West Troy; at locks Nos. 4, 9 and 8, Harmony Mills and Champlain, at Cohoes; Mansion and Ferry streets, Albany. Slight repairs have been made to several other bridges, including painting and raising approaches.

The timber, docking, slope and vertical wall on the Champlain branch, between lock No. 3 and the Cohoes guard lock, through the "sixteen locks" and the nine mile level, have been put in good repair.

The dwelling-house belonging to the State, situated near the State yard at Cohoes, has been thoroughly repaired and painted.

The prism of the canal was, during the spring, cleaned out to conform to the original cross section plan.

The towing-path has been graveled through the city of West Troy, the "sixteen locks" and a portion of the nine mile level.

A new timber shed has been built at Cohoes.

Substantial repairs have been made at the following lock houses, viz.: Nos. 2, 5, 8, 10, 17, and at the combined and guard locks.

New watch houses have been built, one at the upper side cut and one at lock No. 2, West Troy, and thorough repairs have been made by painting, shingling, new doors, etc., at locks Nos. 3, 4, 9, 10, 11 and 14.

The Mohawk basin at West Troy side cut, the pond above sloop lock, and the channels leading into the river at both side cuts at West Troy, have been thoroughly dredged.

No breaks or delays have occurred. Navigation has not been interrupted at any one time more than a few hours.

At least seven feet of water has been maintained the past year, as required by law.

One hundred additional snubbing posts have been set above and below the different locks.

Seven boats have sunk on this section during the past season, but none from the fault of those in charge of the canal.

The Albany basin has been dredged sufficiently to meet all the requirements of navigation.

The work of removing the wall bench, and building slope and vertical walls, from Port Schuyler to Crescent, is in progress. Further appropriations will be necessary to complete this important and necessary improvement of navigation.

Ten patrolmen were appointed by the Canal Board to assist navigation and enforce canal regulations on this section, and continued in office to December 10th. In the fall of 1869 and spring of 1870, before their appointment, assistance to navigation was furnished by the superintendents as stated below.

New waste gates were inserted by the superintendent in the lower Mohawk aqueduct.

The following statement shows the total expenditures of all kinds upon the section for the fiscal year. The undersigned, as secretary of the Board of Canal Commissioners, pays for certain miscellaneous expenditures of the Board of Canal Commissioners and of the canals of the whole State, and also for all miscellaneous expenses for the eastern division of every kind, such as engineering, printing, advertising, stationery, clerk hire, office expenses at Albany, etc., etc., which are not chargeable to any particular section. All these items, from custom and for convenience, are charged to section one, Erie canal, which make the miscellaneous expenditures of that section seem much larger than that of any other section in the State. The items may be found in the division engineer's report and in the Auditor's annual report of expenditures.

The expenditures for the fiscal year, upon section 1, Erie canal, were as follows:

ORDINARY REPAIRS.

Drafts on Auditor.

Repair contract	\$65,041 67
Dredging	81,421 50

Total paid repair contractor.....	<u><u>\$146,463 17</u></u>
-----------------------------------	----------------------------

Draft for engineering E. D.....	\$5,200 00
Commissioner's salary	1,500 00
Steam engine and pump	1,525 00
Stone dam at Cohoes (excess over old plan).....	34,493 00

\$189,181 17

Miscellaneous Expenditures.

Salaries of clerks, patrolmen, etc., printing, advertising, expenses Albany office, and general miscellaneous expenses for the Eastern Division	\$12,016 37
Weed, Parsons & Co., printing bill of 1869	1,359 80

Superintendent's Expenditures.

Salaries, assisting navigation and extra work	4,030 42
Total ordinary repairs.....	<u>\$206,587 76</u>

EXTRAORDINARY REPAIRS.*Drafts on Auditor.*

Wall bench from Port Schuyler to L. M. Aq	\$57,562 00
Wall bench from Port Schuyler to lock No. 2.....	28,678 65
Repairs State dam, Troy.....	5,151 00
Constructing lock No. 2	510 00
Improvement West Troy locks in 1864.....	3,500 00
Iron bridge at Cohoes	3,893 00
Iron sidewalk bridge, Cohoes.....	340 00
Iron bridge at L. M. Aq.....	6,749 00
Iron bridge at Albany (excess over old plan).....	1,287 95

\$107,621 60

Miscellaneous Expenditures.

Railing, Cohoes bridge	455 75
Engineering, Albany office, and extraordinary repairs on section 1.....	11,329 64
Total extraordinary repairs	<u>\$119,406 99</u>
Award canal appraisers.....	<u>\$6,042 00</u>

SECTION No. 2.

BENJAMIN VAN VRANKEN, *Superintendent.*

Extends from the west end of the lower Mohawk aqueduct to the head of lock No. 27, a distance of thirty-two miles.

The structures on this section are :

Eighteen locks ; one guard lock ; seventy-four lock gates ; three aqueducts ; two waste-weirs ; nineteen culverts ; twenty-one road bridges (wood) ; three road bridges (iron) ; eighteen farm bridges (wood) ; two change bridges (wood) ; one tow-path bridge (wood) ; one swing bridge (wood) ; seven lock houses ; one work shop and

timber shed; nine watch houses; one dam across Mohawk river at upper Mohawk aqueduct.

The repair contract upon this section was terminated April 1, 1870. The amounts paid to the repair contractor during the fiscal year will be found in the table annexed. The work done by the superintendent on this section after that date was as follows: The repairs to locks during the spring and summer were ten new lock bridges (two at lock No. 19, two at No. 20, one at No. 21, one at No. 24, one at No. 25, one at No. 26, and two at No. 27;) seven new miter sills (two at lock No. 20, one at No. 21, two at No. 22, one at No. 23, and one at No. 24;) one new bulk-head at lock No. 19, and one repaired at lock No. 19, two at No. 20, two at No. 21, two at No. 22, one at No. 23, two at No. 24, two at No. 25, two at No. 26, and two at No. 27, and new crib at the feeder guard lock, at a total cost of \$1,783.74. The cost of lock tending was \$6,771.40.

There have been constructed twelve new lock gates (two at lock No. 19, two at No. 20, one at No. 21, one at No. 22, one at No. 23, two at No. 25, and one at No. 27;) seventeen new balance beams (four at lock No. 20, three at No. 19, three at No. 21, two at No. 22, two at No. 23, three at No. 24); four new towposts (two at lock No. 20 and two at No. 22); fifty-seven new valves inserted (four at lock No. 19, eight at No. 20, eight at No. 21, eight at No. 22, four at No. 23, seven at No. 24, seven at No. 25, eight at No. 26, and three at No. 27). The other gates on the section repaired and the balance beams and iron work painted, at a total cost of \$5,155.89.

Hoffman's and Van Slyck's aqueducts have been repaired, and new ice breakers on the piers of the upper Mohawk, at a total cost of \$809.15.

The waste-weirs at lock No. 20 and Schenectady were repaired at an expense of \$108.96.

Crescent culvert, which leaked badly, was thoroughly repaired and a part of the arch taken down and relaid. Planter's Kill culvert, which was in very bad condition, was repaired to make it safe, having the side walls relaid, the foundation repaired, and the top clayed and puddled.

Klein's culvert was cleaned and new channel cut to the river, all at a total expense of \$863.69.

There was a new bridge built by the repair contractor at Rotterdam street, in the city of Schenectady, during the winter.

There have been two new bridges built, painted and approaches raised at Dunsbacks and James Pearse.

Jefferson street, Greene street, Union street, Liberty street, State street and Church street bridges, in the city of Schenectady, have been thoroughly repaired and painted, and where necessary there have been new needle beams and floor timbers put in, approaches raised and railings erected. Crescent, White's and Public have had approaches raised and have been repaired. Nicholas Clute's has been repaired, approaches raised and one abutment relaid. Twenty-four other bridges have been painted and repaired. John Klein's, replanked and new needle beams. Van Slyck's, replanked, painted, new needle beams inserted, railings erected and painted. Crawford's, new needle beams inserted, replanked and painted. Patterson's, replanked and painted. Philip's, painted and sway braces repaired. Swing bridge, thoroughly repaired. Visscher's, painted and repaired, approaches raised and railings erected, at a total cost for bridges of \$4,043.50.

There has been a new State scow purchased at a cost of \$1,300.

There has been seven new watch-houses built and painted. One each at locks Nos. 19, 21, 22, 23, 24, 26, and 27; and the old (at Nos. 20 and 25) painted and repaired, at a total expense of \$591.44.

There has been paid for rent of storehouse and land for storing timber, at Schenectady, \$120.

The tow-path on all and the berme bank on some of the levels have been raised, widened and strengthened, retaining wall along the river on the four and three and a half mile levels, damaged by the freshet of April, relaid, and snubbing-posts set on all the levels, at a total cost of \$11,858.76.

During spring repairs the prism of the canal on all the levels was thoroughly cleaned to give a depth of seven feet of water, at a cost of \$11,819.77. A portion of this expenditure was caused by the removal of material washed in from the creeks by the high water of April 21st, 1870.

Clutes' creek was turned, and a new channel made to prevent gravel from being washed in the canal, at an expense of \$720.95.

Hoffman's creek, under the arches of Hoffman's aqueduct, and to the river, was cleaned to give a free discharge of water, and Mill creek cleaned, all at a total expense of \$2,081.36.

The dam across the Mohawk, at the upper aqueduct, has required slight repairs, at an expense of \$25.80.

The slope wall, on seven and four miles levels (where the breaks of

4th October, 1869, and 11th November, 1868, occurred), has been put in, and other slight repairs made, at an expense of \$607.18.

The docking on seven and three and a half miles levels has been repaired, at an expense of \$572.30.

A breach in the feeder at the upper Mohawk aqueduct, caused by the high water of 19th April, 1870, overflowing from the river and undermining the feeder bank, causing it to fall, and causing other breaks in the level below, was repaired at a cost of \$5,667.01.

A small break on nine mile level, which occurred after the close of navigation, was repaired at an expense of \$167.50. Total for repairs of breaches, \$5,834.51.

The total cost of watching canal and regulating the water was \$761.74.

A full depth of seven feet of water has been maintained on the entire section for the past season.

There was expended on the sinking boat, M. W. Newcomb, loaded with lumber (no detention to navigation), the sum of seventeen dollars; on the sunken boat, J. Vanderbilt, \$42.97, which was refunded; on the boat P. Manor, in a sinking condition (no detention), ten dollars, which was refunded. Total expended on boats, \$69.97.

There was expended for assistance to boats, and facilitating navigation in the fall of 1869, after break of 4th of October was repaired, \$1,028.50.

Miscellaneous expenditures for objects not before enumerated	\$1,035 12
Clerk hire	450 00
Superintendent's salary.....	1,100 00
	=====
Cost of new structures	\$16,319 29
Cost of repairs of old, including salaries	42,473 49
	=====
	\$58,792 78
	=====

Inventory of property on hand:	
Materials	\$9,155 00
Boats, tools and implements.....	5,970 50
	=====
	\$15,125 50
	=====
Miscellaneous receipts	\$67 97
	=====

Under extraordinary repairs, the work of removing the wall bench and building slope wall from lock No. 20 to a point one mile above

the upper aqueduct upon the tow-path side, has been completed, at a cost stated in the table annexed.

A portion of the similar work from the lower aqueduct to lock 19, has been done, and the balance, together with that between locks 19 and 20, will be completed in another year, which will greatly improve navigation upon this section.

EXPENDITURES SECTION No. 2—ORDINARY REPAIRS.

Drafts on Auditor.

Repair contract	\$15,260 28
Break account of October 4th, 1869	29,656 89
	<hr/>
	\$44,917 17
Inventory materials, tools and boats.....	18,636 93
	<hr/>
Total paid repair contractor	\$63,554 10

Superintendent's Expenditures.

Total ordinary repairs.....	58,792 78
	<hr/>
	\$122,346 88

EXTRAORDINARY REPAIRS.

Drafts on Auditor.

Removing wall bench, etc., from lower aqueduct to lock 19.....	\$6,035 00
Wall bench, etc., from lock 20 to a point one mile above upper aqueduct	32,690 92
	<hr/>
	\$38,725 92

Miscellaneous Expenditures.

Completing wall bench, etc., from lock 20, to a point one mile above upper aqueduct	21,178 24
Engineering	2,837 50
	<hr/>
	\$62,741 66
Award of Canal Board.....	\$10,832 40
Award of Canal Appraisers.....	1,881 00
	<hr/>

SECTION 3.

JAMES SHANAHAN, Superintendent.

Extends from the head of lock No. 27 (three miles east of Amsterdam), west to the foot of lock No. 34, and is thirty-seven miles in length.

The structures on this section are fourteen lift locks; three guard locks; seventy lock gates; ten aqueducts; twenty-nine culverts; five waste-weirs; thirty-one farm bridges; eighteen road bridges (wood); six road bridges (iron); one new suspension bridge at Fort Plain; two dams; two work shops; three dock houses.

The section was under contract at a price per annum of \$27,000 up to April 1st, 1870, when it was surrendered. During the time it was under contract occurred the great freshet of October 4, 1869, which tore away the banks on both sides of the Schoharie creek, above and below the dam, doing great damage to the creek walls and aqueduct, and particularly to the west end of the dam. During the fall and winter the banks were raised and suitably repaired, the walls relaid, the culverts of the aqueduct cleared out, and the west end of the dam protected by crib work filled with stone. A large amount of necessary work was done by the repair contractor at an expense (over and above the \$7,000 retained) chargeable to the break account, amounting to the sum of \$73,117.59.

As a precaution against the immense boulders of ice that come down with sweeping force at the opening of spring, the upper ends of the piers of the Schoharie creek aqueduct have been covered with solid white oak timber.

During the year, two of the piers of this aqueduct noticeably depressed, being undermined by the action of the water. Around these depressed piers cribs of timber have been built and filled with stone, which has thus far prevented any further settling of these piers.

On the 21st of April, 1870 (before the opening of navigation), there occurred another break which burst through the tow-path, berme and feeder banks, in several places on the five, two and a half and one mile levels. At one point three hundred feet of tow-path was swept away to a depth below canal bottom. The freshet was caused by an extraordinary rain, commencing on the 19th of April, and continuing through the 20th and 21st, causing the Schoharie creek to rise to an unprecedented height, tearing through its banks into the canal and filling it to overflowing. Every available laborer was employed, and the numerous breaches were suitably repaired three days before the opening of navigation.

The repairs on the section during the past season have been very extensive. The towing-path, throughout its entire length, has been generally raised and graveled.

The culverts and creek channels were nearly filled up, in many

instances had never been cleaned out. Two hundred snubbing posts have been set on the section. During the entire season navigation on this section has been unparalleled. Boats have not been delayed an hour. The feeders have been attended to by prompt, energetic and efficient men, who have regulated them so as to give a full supply of water during this remarkably dry season. The following is a statement of the work done and the cost:

At locks Nos. 28, 29 and 30 repaired bottom, new docking at the head of each; repaired miter sills and paddles; placed new foot bridges and inserted eight new snubbing posts at each. Lock No. 31, repaired piers and miter sills, planked bottom of the culvert, repaired foot bridges and set one lamp post and eight snubbing posts; lock No. 32, repaired miter sills and piers, planked culvert, inserted four new stop gates, new platform, set two lamp and five snubbing posts; lock No. 33, repaired miter sills, piers, culvert lock bottom, inserted four new stop gates, placed new foot bridge over lock and set five new snubbing posts. The repairs on locks cost \$1,848.70.

The cost of lock tending on this section for the season has been \$4,618.64. The oil for locks cost \$63.

Most of the lock gates have been put in good condition: Locks Nos. 28 and 30, new valves, fender, plank on upper gate, repaired the old gates with new castings; lock No. 29, three new gates with valves, two new valves in the upper gate, fender plank on upper gate, repaired the old gates with new castings, bolts, keys, clasps, etc.; lock No. 31, two new gates with valves, one new balance beam and four new valves in the old gates, new castings, clasps, bolts, etc.; lock No. 32, two new lower gates with valves, two new valves, new castings, clasps, etc., on the old gates; lock No. 33, four new gates with valves, one new valve, new castings, etc., on the old gates. The cost for lock gates is \$2,723.23, which sum does not include the ten new lock gates inventoried from the contractor.

The large number of aqueducts on this section involve considerable expense. Repairs have been made as follows:

Phillips', new flooring in both arches. Schoharie creek, new siding on north side, repaired flooring, repaired south side by inserting new braces, new uprights, planking and straining beams, repaired docking on both ends; Printups', new side with three new water gates, new braces on the old side, and repaired flooring;

Yatesville and Lasher's, one new side, repaired old siding and flooring of each; Spraker's new side, repaired old side, bottom and waste gates, and rebuilt apron; Canajoharie, new wood trunk; Fort Plain, three spans of the wood trunk have been made new sills, flooring and sides repaired. The total expense of aqueducts was \$4,816.38.

The waste-weirs have required slight repairs. Port Jackson, two new gates, and grouted the wall; Mitchell's, repaired bottom and gates, inserted new braces; Cornelius', new wood work and foot bridge. Cost of all, \$204.40.

The culverts at Kittles and Sparks have been cleaned out, and suitable channels opened to give a free passage to the river, at an expense of \$834.60. The culvert just above lock 28, was destroyed by the freshet of October, 1869, and was filled up. It must be rebuilt during spring repairs. The following is a statement of the work done upon bridges:

New bridges at Van Alstyne's, Canajoharie, Gas House, Beales', Crouse's. Three new bridges over Rocky Rift, and one over Schoharie creek feeder.

The following bridges have been repaired: Enders, new floor; Hudson's, new floor, floor timbers and sway braces; Putnam's, new braces, repaired floor and sway braces, and spliced chords; Irving's, spliced chords, two new needle beams, sway braces, and repaired floor; Swanker's, two new sway braces, and repaired floor; George Koons, raised, and floor repaired; Poor House, repaired siding and floor, one new sub-chord, brace and needle beam; Sand Hill, repaired floor, new straining beams; Snyder's, repaired floor spliced chords, two new needle beams and sway braces; Starine's, spliced chords, repaired floor, two new braces, sub-chord and needle beam; Printup's, repaired floor, three new braces, sub-chord, new floor timbers and sway braces; A. Yates, repaired floor, spliced chord, new braces and floor timbers; Downing's, repaired floor, new needle beams; John R. Yates, repaired floor, new sway braces; Abram Yates, spliced chord, new straining beam, new needle beams; Lasher's, new floor timbers; Mitchell's, spliced chord, new straining beams, repaired floor, needle beams; Port Jackson (road), repaired sidewalks and railing; Printup's (tow-path), new floor timbers and floor; Yates and Lasher's (tow-path), new floor; Vrooman's and Spraker's (tow-path), three needle beams, repaired floor and ceiling; Van Evera's, repaired floor; Kelly's, wooden abutments, spliced

chords and repaired floor; L. Van Alstyne's, new wall timbers and repaired floor; Dry Dock, repaired floor, and ceiled over sides; Canajoharie, repaired floor; Allen's, raised, new wall timbers, new needle beams and repaired floor; Kittle's, raised, new wall timbers, spliced chords; Fort Plain suspension, new wood work; Smith's, repaired floor; Powell's, two new needle beams, six new sway braces, and repaired floor; Cox's (road), repaired floor and chords; at a total cost, including work done on approaches, of \$3,705.43.

The lock houses have been slightly repaired, and that at lock No. 28 shingled; at lock No. 30 painted. Total cost, \$309.20.

The watch houses at locks Nos. 28, 29 and 30 have had new roofs and been painted; Nos. 31 and 33 painted, and No. 32 shingled. Cost, \$154.40.

The tow-path has been raised generally throughout the section, and also the berme banks on one, two and a half and fourteen mile levels, at a cost of \$4,644.73.

Cleaning bottom of canal, during spring repairs, on all the levels, cost the sum of \$6,520.70.

For cleaning out creek channels at Phillips', Port Jackson, Yatesville and Lasher's aqueducts, there has been expended the sum of \$2,411.93. Spraker's aqueduct will require considerable repairs in the spring.

The dam at Schoharie creek has been graveled to stop leaks, timber coping relaid on the north side, and new timber inserted on the south side, at a cost of \$1,686.03.

The slope walls on the two and a half, one, fourteen and three mile levels have been repaired, at an expense of \$932.

New docking has been put in: 1,500 feet at Port Jackson on the five mile level, 1,400 feet at Fultonville, 250 feet at Spraker's Basin, and 480 feet at Canajoharie, at an expense of \$936.85.

The repairs of breaches in the canal and feeder below Schoharie creek, caused by the freshet of April 19th, 20th and 21st, 1870, building new tow-path bank for 300 feet on two and half mile levels, and new berme bank and tow-path bank on one mile level, repairing breaches on five mile level, and the dyke at Hudson's, cost the sum of \$35,675.45.

Watching canal, night and day, for the season, on all the levels, cost \$1,051.54.

The expense of tending Rocky Rift feeder cost \$423.

Miscellaneous expenditures.....	\$476 11
Clerk hire	450 00
Superintendent's salary.....	863 89

Cost of repairs to breaches	\$35,675 45
Cost of new work	8,211 67
Cost of repairs to old work, including salaries	31,431 64
	<hr/>
	\$75,318 76

Inventory.

Materials on hand	\$4,043 50
Boats, tools and implements.....	5,000 78
	<hr/>
	\$9,044 28

Under extraordinary repairs, the work upon apron of Schoharie creek dam, an iron bridge at Spraker's Basin, and a drain at Fort Plain, have been completed, and the work of filling up a portion of Canajoharie basin, and building a vertical wall along the same, done during the fiscal year.

The work of lengthening Schoharie creek dam has since been advertised and let. It is believed that this improvement will give additional security to the canal feeder and aqueduct at that dangerous point.

EXPENDITURES SECTION No. 3—ORDINARY REPAIRS.

Drafts on Auditor.

Repair contract.....	\$15,862 50
Break account, October 4, 1869.....	73,117 59
	<hr/>
	\$88,980 09
Inventory materials, tools and boats	15,069 94
Certificates of deposit and interest.....	4,423 46
	<hr/>
Total paid repair contractors.....	\$108,473 49
Superintendent's expenditures	75,318 76
	<hr/>
Total ordinary repairs.....	\$183,792 25

EXTRAORDINARY REPAIRS.

Drafts on Auditor.

Final account, apron Schoharie creek dam	\$2,783 82
Final account, drain at Fort Plain.....	400 82
Final account, bridge at Spraker's basin.	1,520 00
	<hr/>
	4,704 64

Miscellaneous Expenditures.

Vertical wall across Canajoharie basin..	\$2,300 00
Engineering.....	315 00
Advertising, etc.....	155 76
	—————
Total extraordinary repairs	7,475 40
Erie enlargement, award canal appraisers.....	534 63
	—————

SECTION No. 4.

DANIEL M. GOLDEN, *Superintendent of Repairs.*

Extends from foot of lock No. 34 to head of lock No. 45, at Fiank-fort, a distance of twenty-two miles.

The structures upon this section are twenty-four lift locks; one guard lock; ninety-eight lock gates; four aqueducts; seven waste-weirs; ten culverts; twenty-four farm bridges (wood); ten road bridges (wood); three road bridges (iron); one tow-path bridge (wood); one swing bridge (wood); one dam; one feeder with bulk-head; two feeders with guard locks; eight lock houses; twelve watch houses; one collector's office; two work shops.

This section was under contract for repairs at a price per annum of \$34,800, from May 1, 1869, to January 1, 1874, but was surrendered, to take effect April 1, 1870. Reuben C. Petrie was superintendent up to that date.

After April 1st, under the superintendent, a new coping of timber was put on lock 37, to prevent flooding the tow-path and lock. The stone coping on lock 38 was in such bad condition that it was necessary to remove it, clean off the old cement and replace with new. The locks from 34 to 45 inclusive, have been thoroughly repaired this season, at an expense of \$4,985.80.

On the 26th of September the bottom of heel-path lock No. 40 and culvert was discovered to be in a very bad condition. The old flooring was removed and new put in, which was thoroughly concreted, and other necessary repairs were made.

The culvert being nearly full of gravel, was also cleaned out. It required three days to do the work, and the lock afterward operated well, at an expense of \$1,000, not including several bills paid after September 30th.

The total cost of lock-tending was \$9,024.

The repairs of lock-gates this season has been very extensive.

Three new lock-gates have been inserted in locks Nos. 38, 42 and 45. The gates repaired extend from lock 34 to 45 inclusive, at a total cost of \$6,060.60.

The aqueducts at Castle Creek, Little Falls and Mohawk, have been repaired this season at an expense of \$638.78.

In September the bottom and side of the north end of aqueduct at Little Falls, became so leaky that it became necessary to repair it. The old flooring and sides were taken out and new put in, at a cost of \$1,185.07.

Repairs have been made to the following waste-weirs: at Fink's, in feeder at Little Falls, at lock 36 and Shepherd's, at a cost of \$706.50.

There has been expended in cleaning Stauring's culvert and ditch, on Jacksonburgh level, and on Spencer's culvert, at Mohawk, the sum of \$213.15.

The following bridges on the section have been repaired: Repair and painting at Mindenville road and Brazee's farm bridge, on Mindenville level; repair of Critzenger's, Halls' farm and Fink's road bridge, on five mile level; repair of draw bridge at Little Falls; repair of first bridge above lock 39, Sharp's, and painting Caster bridge on Little Falls level; repair of Steele's and Stauring's bridge, on Jacksonburgh level; repair of Doughty's, and repair and painting Lower River, Herkimer and Otsego street bridges, on Fort Herkimer level; repair and painting Myers' farm bridge, and raising approach at Gas Factory bridge, on Ilion level; Richardson farm bridge on one mile level, and replanked the Bridge street bridge, in the village of Mohawk, with new oak plank; repaired Sharp's farm bridge, on Little Falls level; also raised the approach to the new iron bridge in the village of Ilion, at the cost of \$4,055.34.

Two new bridges have been put up this season, as follows: One new road bridge at Wheelin, and one new farm bridge at Snell's, on Mindenville level; the cost of which was \$1,859.27.

There has been built a new watch house at lock No. 45, the cost of which was \$137.91.

The towing-path at the locks, and between the locks, has been in many places raised and graveled, and otherwise repaired, to prevent the water from the river running over during the high water in the spring, and from the canal, during navigation, at a cost of \$2,604.22.

Before opening of navigation in the spring, the entire prism of canal was well cleaned out, excepting opposite the agricultural works

in the village of Ilion, where there were boats lying. At this point the canal should be well cleaned out in the spring. There has been good navigation, the entire season, on this section; no detention or other delays whatever, except four days at lock No. 40, in September last. The cost of cleaning out bottom of canal, last spring, was \$8,153.03.

For cleaning Furnace creek, Furnace creek feeder and basin, at Little Falls, Steele's creek, in the village of Ilion, and reopening Van Slycke and Steele's ditches, on the Jacksonburgh level; the expense has been \$926.34.

The dam at North side of Mohawk river, at Little Falls, has been repaired at the cost of \$177.44; repairing slope walls on section, \$528.43.

The repairs of docking, at lock No. 34, between locks 37 and 39, putting on docking on Five Mile and One Mile level; also putting in docking at the head of lock 34, cost \$2,294.26.

Competent watchmen have been employed to watch the levels and banks of the canal night and day, to assist boats, and to prevent crowds on section, at a cost of \$942.

The miscellaneous expenditures on the section, including tools, etc., has been \$1,327.21.

Superintendent's salary for the year, \$1,100; clerk hire, for six months, \$450.

The proper depth of water has been maintained during the past season.

Cost of new structures, as classified by superintendent..	\$4,528 60
Cost of repairs to old, including salaries.....	<u>44,272 37</u>

\$48,800 97

Inventory:	
Materials on hand	\$3,343 96
Boats, tools and implements.....	<u>5,700 05</u>
	<u><u>\$9,044 01</u></u>

Miscellaneous receipts, \$110.

Under extraordinary repairs, the work of removing wall bench and building slope and pavement wall from locks 43 to 45, at Frankfort, on the tow-path side, has been nearly completed. A new iron bridge has been built at Ilion, in place of the old wooden bridge; and a new wood road bridge and abutments are in progress over a new street next east.

New tumble gates have been inserted at the head of locks Nos. 44 and 45, by Geo. Heath, at a cost of \$9,000, which work admirably, and effect a great saving in time of lockage, and in use of water.

The extension of the culvert below lock No. 44, has been put under contract, and the work will be ready for navigation.

The Canal Board has authorized an expenditure of \$4,000, by Geo. Heath, to try the experiment of utilizing the water used in locking at lock No. 37, at Little Falls, for the purpose of assisting the opening and closing of the lower gates, and for drawing boats in and out. An appropriation for this amount will be needed.

EXPENDITURES, SECTION No. 4—ORDINARY REPAIRS.

Drafts on Auditor.

Repair contract	\$13,440 30
Inventory materials, tools and boats.....	17,047 88

Total paid repair contractor.....	\$30,488 18
Superintendent's expenditures	48,800 97

Total ordinary repairs	\$79,289 15

EXTRAORDINARY REPAIRS.

Drafts on Auditor.

Wall bench, etc., locks 43 to 45.....	\$35,462 00
New bridge at Ilion.....	3,876 00
Tumble gates, locks 44 and 45.....	9,000 00

	\$48,338 00

Miscellaneous Expenditures.

Engineering	1,874 00
Advertising, etc.....	140 72

Total extraordinary repairs.....	\$50,352 72

Award of Canal Appraisers	\$5,096 25

SECTION No. 5.

GILES HAWLEY, Superintendent of Repairs.

This section extends from the head of lock No. 45 at Frankfort, to the east bank of the Oneida Lake canal at Higginsville, nine miles west of Rome, a distance of thirty-four miles.

The structures upon this section are: One lift lock; one weigh lock; four aqueducts; twenty-nine culverts; twenty-three farm

bridges (wood); six farm bridges (iron cord); eighteen road bridges (wood); eighteen road bridges (iron); one towing-path bridge (iron); one foot bridge (wood); two foot bridges (iron); two lock houses; two work-shops; two watch-houses; one collection office at Utica.

The repair contract on this section, was terminated April 1st, 1870. During the fall of 1869, \$202.50 was paid for assisting navigation; and \$355.21 for materials and labor on Bank street bridge at Rome. Since April 1st, the lock on this section, No. 46, at Utica, has been generally overhauled and repaired during the year, amounting to \$521.51.

The amount expended for lock tending, is \$652.66.

There has been three new lock-gates inserted complete, two in guard lock No. 46, at Utica, and one at the weigh-lock (with repairs to old), at a total cost of \$1,617.60.

There has been expended stopping leaks and general repairs of Oriskany, Frankfort, Ferguson's and Yorkville aqueducts, on nine and sixty mile levels, including timber, plank, blacksmithing, etc., \$695.51, and for putting in new trunk at the Yorkville aqueduct, refitting and thoroughly repairing the same \$2,220. Further repairs are needed upon the aqueducts.

The waste-weirs at Tifts', Fort Bull, Higginsville and City Mills, have been repaired during the year, to the amount of \$554.08.

Whitall's creek, Higginsville, Smith's and Martin's culverts, on the sixty mile level, have been repaired to the amount of \$258.60.

The weigh lock at Utica has been repaired to the amount of \$296.56, to the flooring, scales and valves, besides mason work at head of the lock, painting, etc.

Ten wood farm bridges (viz.): Brainard's, Powell's, Hulser's, Van Buren's, Cheesman, Taft's dry dock, Cold Spring, Fort Bull and Hawley's basin, have been repaired by putting in plank, braces, rods, repainting, etc.

Eight wood road bridges (viz.): Bridenbecker's, Myers, Morris, Big basin, Whitesboro street, Depeyster street, Wing's and Lawton's, have been repaired by planking, raising approaches, painting, etc.

The Clark street bridge has been rebuilt. Nine road bridges (iron) have had their wood work entirely replaced, viz.: Halfway, Yorkville, two at Whitesboro, Oriskany, Newville, James street, George street, Rome and New London. The approaches to James street, including stairs, etc., and George street, both in the city of Rome, also New London bridges, have been thoroughly repaired.

The whole cost of this work upon bridges, for new structures and repairs to old, has been \$16,215.34.

There has been one new watch house built at lock No. 46, at a cost of \$140.75.

There has been repairing done to the work shops on the section, amounting to \$78.37.

The raising and strengthening tow-path and berme bank, not including repairs to slope walls, has formed an important item in the expenses of this section. The towing-path and berme banks, on a large portion of this section, had been very much worn and settled, and the safety of the canal endangered.

The berme banks at and east of Newville, have been raised for the purpose of protecting against the water flowing from the south, at a cost of \$2,540.

Three State scows have been kept busy nearly throughout the season, and to good advantage, raising and repairing the points lowest and weakest on the entire section, at a cost, in addition to the above, amounting to \$6,766.40. There has been expended, for one new State scow, \$1,200. The repairs to old State scows has been \$218.21.

Many of the snubbing-posts which had nearly disappeared from the section, have been replaced. The expense for posts and setting, has been \$443.27.

In cleaning out bottom of canal during spring repair, large accumulations of earth were found in prism of canal throughout the whole section, it not having been properly cleaned out for many years past. There are many small creeks flowing into the canal on this section. The deposits of earth from these creeks and from other causes, accumulating on the berme side of the canal, largely increased the expense of bottoming out last spring. The work was well and thoroughly done, at a total cost, for the thirty-four miles, of \$15,215.80.

The creek channels and State ditches at and in vicinity of Grove Springs, Stacy's Basin, below Newville, Whitall's creek, Darling's, Tuttle's, Dunn's and Martin's creeks, have been thoroughly cleaned out; no work of this kind has ever before been done on this section since the enlargement of the canal, and not only the creeks, channels and ditches belonging to the State at the points above named, but all culverts made for their passage (mostly diving culverts) under the canal had become nearly or entirely clogged up and the surround-

ing country overflowed and banks endangered, more or less, in consequence. The expenditure has been \$2,752.81.

There has been expended on slope and vertical walls the amount of \$500.

The docking was repaired at Utica, Rome and New London, amounting to \$488.90.

A break occurred at Whitesboro, May 17th, 1870, on sixty mile level, caused by old pump logs running across the canal through the bottom of tow-path. Navigation was suspended, in consequence, four days. The aggregate cost of repairing the same was \$5,395.23.

There has been expended for watching canal and waste-weirs at Higginsville, Fort Bull, Rome, Tifts, Oriskany, Whitesboro, in vicinity of break, Utica, Ferguson's and Frankfort, the amount of \$916.61.

With the exception of the four days' detention in May from the Whitesboro break, navigation on this section has been delayed but very little during the summer, and then only for a few hours at a time during the 23d, 24th and 25th of August, owing to low water on the long level. The care and prompt attention of those in charge of the supply of water made navigation very easy, compared to former years, on this level, which, owing to its length, and lack of feeders, is a difficult one to manage.

Miscellaneous expenditures.....	\$825 13
Clerk hire	450 00
Superintendent's salary.....	1,100 00
Cost of new structures.....	\$10,074 70
Cost of repairs to old, including salaries.	52,543 93
	\$62,618 63

INVENTORY.

Materials on hand.....	\$2,095 13
Boats, tools and implements	3,436 99
	\$5,532 12

Miscellaneous receipts, \$40.

Under extraordinary repairs an iron foot bridge has been built at Utica, and the wall bench removed and new wall built, in the eastern part of the city. There has also been constructed a new iron bridge at Washington street, and the old one removed to George street, and

625 feet of docking at Rome. The greater portion of the \$2,000, appropriated for excavating original materials at Oriskany, has been expended, and navigation at that point very much improved.

There should be a new vertical wall, laid in cement, built from the guard lock at Utica, 1,000 feet east, on the berme side. White Creek culvert, near Rome, should be rebuilt.

EXPENDITURES — SECTION No. 5.

Ordinary Repairs — Drafts on Auditor.

Repair contract.....	\$7,931 20
Inventory, materials, tools and boats.....	5,883 51
	<hr/>
Total paid repair contractor	\$13,814 71
Superintendent's expenditures	62,618 63
	<hr/>
Total ordinary repairs	\$76,433 34
	<hr/>

Wall bench, etc., at Utica.....	\$9,503 00
Iron foot bridge, Utica	1,020 00
Two bridges, Rome	11,187 86
Constructing docking at Rome.....	3,845 08
Engineering Fish Creek feeder.....	4,800 00
	<hr/>
	\$30,355 94

Miscellaneous Expenditures.

Engineering.....	1,756 57
Excavating at Oriskany.....	651 96
Advertising, etc.....	187 88
	<hr/>
Total extraordinary repairs.....	32,952 35
Awards of Canal Appraisers.....	\$46,176 26
Awards of Canal Board.....	700 00
	<hr/>
	46,876 26
	<hr/>

CHAMPLAIN CANAL.

SECTION No. 1.

GEO. W. NEILSON, *Superintendent of Repairs.*

Extends from a point 200 feet north of Cohoes guard lock, including Waterford side cut, to foot of first lock north of Saratoga dam, a distance of twenty-eight miles.

The structures on this section are : Eleven locks ; one weigh lock ; forty-four lock gates ; one aqueduct ; eleven waste-weirs ; seven culverts ; forty-two farm bridges ; twenty-six road bridges (wood) ; two road bridges (iron) ; eight tow-path bridges ; six lock houses ; seven watch houses ; three store houses ; two work shops ; ten foot bridges ; one collector and weigh office ; Saratoga dam, 900 feet ; Cohoes dam, 1,600 feet long.

This section was under charge of Geo. L. Ames as superintendent up to April 1, 1870.

The following is a condensed statement of repairs made on this section by the superintendent since April 1, 1870 :

Repairs to Mohawk guard, Waterford combined, Waterford three, Flynn's and Saratoga guard locks, \$453.05. The cost of lock tending was \$4,593.58.

Rebuilding two new lock gates at Waterford three, one at Flynn's and repairs to Mohawk guard, Waterford combined, Waterford three, Flynn's, Hewitt's, Becker's and Saratoga guard lock, \$1,625.71.

Repairing, caulking and strengthening Flynn's, Fitzgerald's, Mechanicsville, Stillwater, Bemis Heights, Wilbur's basin, Searle's, Coveville and Northumberland waste-weirs, \$1,554.68.

Cleaning out and repairing Cramer's, Powers', Flynn's, Smith's White's and Salisbury's culverts, \$200.50.

Rebuilding Best's, Ensign's and Gannon's farm bridges, and Northumberland change bridges ; also abutments at Lansings' and Hill's, and repairs to fifteen others.

New vertical wall has been constructed at Husted and Lane's landings, Bemis Heights, opposite the breaks of October 4th, and 100 feet near Salisbury's, to give increased width to prism, and also across the south side of berme bank and the mouth of the side cut at Schuylererville ; also a large quantity of new slope wall has been put in at the Coveville, Wilbur's basin and Bemis Height's breaks, and the old wall at different points on the three, four and sixteen mile levels, which was damaged by the freshet of October, was relaid during

spring repairs. The stone for this work had been delivered by the repair contractor during the winter. The total amount expended for laying slope and vertical wall has been \$5,055.64.

The repairs to the Saratoga dam have been quite extensive; new crib work filled with stone has been constructed to support the south bank, and substantial repairs made to the old portion, including the stopping of leaks with brush, stone and gravel. The amount expended by superintendent, including slight repairs to the Mohawk dam at Cohoes, was \$2,956.63; including abutments and filling in approaches to same, \$2,929.41.

Repairs to boats Crocker and Neilson, \$65.11.

Setting snubbing posts on three and three-fourths, one, four and sixteen mile levels, on tow and berme banks, \$135.

Raising, repairing and strengthening towing-path and berme banks on two, three and three-fourths, one, four and sixteen mile levels, \$5,287.62.

Cleaning out bottom of canal to a uniform width of thirty-five feet and depth of five feet of water on two, three and three-fourths, one, four and sixteen mile levels, \$10,359.34.

Rebuilding and repairing docking at Mohawk and Hudson river, and on the section generally, \$5,206.46.

Building timber cribs and filling the same with stone at foot of tow-path, to prevent further slide of same near Victory storehouse on sixteen mile level, \$854.

Watching canal banks, \$573.50.

Erecting regulation lamps and posts at Saratoga guard, Flynn's, Waterford three, and Mohawk guard locks, \$94.50.

Assisting boats and facilitating navigation at Waterford three and Flynn's locks, rendered necessary by the contracted chamber of these narrow locks, causing great difficulty in passing large-sized boats, \$1,083.44.

Removing earth from tow-path at Mohawk river and two mile level, deposited by steam dredge from channel, \$794.12.

Telegraphs, freights, and superintendents and miscellaneous expenses, \$480.15.

Superintendent's salary, \$1,100.

Clerk hire, \$550.

Cost of new structures.....	\$11,502 89
Cost of repairs to old, including salaries..	34,538 55
	<hr/>
	\$46,041 44

Inventory.

Materials on hand	\$5,674 18
Boats, tools, implements, &c.....	4,714 22
	<hr/>
	\$10,388 40
One State dredge	10,000 00
	<hr/>
	\$20,388 40

There has also been expended the sum of \$1,845.76 for dredging the Mohawk river, at Cohoes, by the State dredge, during the summer.

The Waterford weigh lock has been put in thorough repair, the bed raised, and other improvements made, at a total cost of \$2,830.78.

The raising and widening the approaches of Railroad street bridge at Mechanicsville was completed in the fall of 1869, at a total cost of \$1,298.05.

Hewett's lock has been rebuilt on the enlarged plan, with Heath's patent tumble gates, \$17,000 of the expense being paid from extraordinary, and the balance from ordinary repairs. Flynn's lock is now under contract and the work in progress. The sluices at Saratoga guard lock, the improvement at Schuylerville, and two new farm bridges, near Mechanicsville, have been completed at a cost stated below.

The three locks above Waterford should be rebuilt upon the plan of reconstructing the upper and lower locks, on the enlarged size, and of such lift as to dispense with the middle lock, and of enlarging the level thus lengthened. A plan has been prepared upon this basis, and the cost estimated at \$99,000, including section work. Delays are unavoidable at this point during the busy season, and the expense incurred by the superintendent in assisting navigation must be continued until the locks are rebuilt.

The work of building Saratoga dam has been begun, and must be completed during the summer.

The upper timbers of the wooden guard lock, north of Cohoes dam, are decayed, and should be renewed.

The widening and straightening of the canal at Waterford, near the side cut locks, is in progress, and will be completed by May 1. This improvement had long been needed, and will greatly improve navigation at this point.

ANNUAL REPORT OF THE

EXPENDITURES — SECTION No. 1.

Ordinary Repairs — Drafts on Auditor.

Repair contract	\$8,264 70
Break account	62,643 48
Inventory, materials, tools, boats, etc....	19,454 74
Total paid repair contractor	\$90,362 92
Engineering.....	5,200 00
Hewitt's lock (chargeable to repairs)....	16,065 00
Superintendent's expenditures	46,041 44
	\$157,669 36

Miscellaneous.

Waterford weigh lock	2,830 78
Dredging Mohawk river	1,845 76
Ice breaker.....	642 24
Total ordinary repairs	\$162,988 14

Extraordinary Repairs — Drafts on Auditor.

Hewett's lock (excess over old plan).....	\$17,000 00
Sluice at Saratoga guard lock.....	7,423 79
Improvement at Schuylerville	7,068 87
Farm bridge of L. A. Weaver.....	635 21
Road bridge at Mechanicsville.....	642 76
	\$32,770 63

Miscellaneous Expenditures.

Engineering.....	3,600 00
Raising approaches, Mechanicsville bridge	1,298 05
Land damages.....	1,995 50
Advertising, etc.....	184 74
Total extraordinary repairs.....	39,848 92
Award of Canal Appraisers.....	1,152 00

SECTION No. 2.

GEORGE SATTERLEE, *Superintendent of Repairs.*

Extends from foot first lock north of Saratoga dam, to a point thirty-three feet south of road bridge at Dunham's basin, including the Glen's Falls feeder, feeder dam, and pond above, a distance of twenty-four miles.

The structures upon the section are: Nineteen locks; sixty-six lock gates; three aqueducts; six waste-weirs; nine culverts; eighteen farm bridges (wood); twenty-three road bridges (wood); three road bridges (iron); three tow-path bridges (wood); fourteen foot bridges (wood); seven sluiceways around locks (wood); three lock houses; two work-shops; ten watch-houses; one store-house; one timber shed; one collector's office; one dam nine hundred feet long at head Glen's Falls feeder.

This section was under charge of George B. Sherrill, superintendent, up to April 1st, 1870.

A large amount has been necessarily expended upon this section during the fiscal year, to repair the structures, and give the proper depth and width of prism.

A new apron has been constructed at lock No. 13; the bottoms of locks Nos. 2, 4, 7 and 12, have been replanked, new miter sills have been put in locks Nos. 7 and 13, and new culvert frames in No. 8. The recess masonry at head of two combined locks, has been relaid. New (regulation) lamps and posts have been erected at all the locks, and extensive repairs have been made to the rods, valves, chains, and gearing at Fort Miller, Moses kill, and Nos. 2 and 5 combined locks, and slight repairs to other locks on the section, at a total expense of \$1,689.48. The total cost of lock tending for the nineteen locks has been \$6,182.07.

Eleven new lock-gates have been constructed from first quality white oak timber and inserted at Saratoga discharge, Bassett's two and five, combined, and locks Nos. 1, 12 and 13. Fourteen new balance beams at locks Nos. 5, 6, 10, 11, 12 and 13, and extensive repairs made to nearly all the other gates on the section. Nearly all the gates and balance beams on the entire section have been painted. Total cost, \$3,504.45.

There has been expended for new trusses and extra supports, for the purpose of strengthening wood trunk at Moses kill aqueduct, rendered necessary by increased depth of water maintained on this section the past season, the sum of \$871.02.

Repairs have been made to Tubbs', Slocum's, Lincoln's, Gamble's, Dunham's basin and Cool's waste-weirs, at a cost of \$413.66.

A new stone culvert has been constructed at Robinson's, five mile level, and Blake's and Mott's culverts have been repaired and cleaned out, at an expense of \$1,258.87.

New white oak snubbing posts have been set above and below nearly all the locks on the section, the cost of which was \$123.

New foot bridges and wood abutments have been constructed over side cut at collector's office, Fort Edward, foot bridges at Fort Edward lock, locks Nos. 1, 2, 4, 5, and 2 and 5 combined. Tow-path bridges at Milliman's and Moses Kill aqueducts have been rebuilt, and repairs made to Glen's Falls (iron), Cool's, Argyle, Fort Edward, Pine's, Blackhouse, Howe's school-house, Crocker's and Fort Miller road, and Baker's, Bristol's, Robinson's, Potter's, and other farm bridges. The wing walls at iron bridges in Fort Edward and Glen's Falls have been raised, and nearly all the bridges on the section have been raised, and the earth approaches to the same graveled, the expense of which was \$1,575.84.

The cost of repairing State scows has been \$63.69.

New timber crib and apron have been constructed at foot of sluice around five combined locks, sluices around two and five combined and lock No. 5 have been repaired, and the head of sluice at lock No. 11 has been concreted, at an expense of \$1,296.90.

There has been expended for filling seams with concrete and gravel in rock bottom of Glen's Falls feeder, to prevent the waste of water, the sum of \$1,010.09.

A new work shop for blacksmith has been built, and the work shop and timber shed attached, at Sandy Hill, have been thoroughly painted, at a cost of 208.70.

New watch houses have been constructed at Bassett's, locks Nos. 1, 11, 12, 13, and at two and five combined Glen's Falls feeder, at an expense of \$536.34.

The towing-path on two, one, three, five and twelve mile levels and Glen's Falls feeder has been raised, widened and strengthened nearly the entire length, to guard against breaks or overflow of water, at a total cost of \$12,450.73.

The prism on the entire main canal, from Saratoga discharge lock to Dunham's basin, has been bottomed out to a uniform width of thirty-five feet on bottom, thus giving five feet of water, as contemplated by chapter 186, Laws of 1864. Also, the channel of the Glen's Falls feeder has been cleaned out to its original width and depth, the entire cost of which was \$23,498.56.

Channels have been opened from Robinson's two culverts to the river, rendered necessary by the increase of water from lands above, the expense of which was \$183.62.

Temporary repairs have been made to the Glen's Falls feeder dam (which is in bad condition and should be immediately rebuilt, to pre-

serve navigation), and a new dam constructed across the old side cut at Fort Miller, to protect canal at that point from high water in the river, at a cost of \$1,344.57.

New slope and vertical wall have been constructed on a portion of two, one, three, five and twelve mile levels and Glen's Falls feeder, including the repairs to old at an expense of \$2,262.97.

New docking has been constructed at different points on the Glen's Falls feeder, and on the two, one, three, five and twelve mile levels, and the old docking repaired, the cost of which was \$2,946.31.

One break has occurred on this section the past season (Sunday, May 22d), near Green's bridge, Glen's Falls feeder, caused by old water course through seams in rock under prism. Navigation delayed twenty-four hours; was repaired at an expense of \$1,168.57.

Competent watchmen have been employed throughout the season over the high and dangerous embankments during the night and day-time, thus preventing any serious break on this section, at a cost of \$2,564.20.

There has been paid for tools, superintendents' traveling expenses and for other miscellaneous expenditures, the sum of \$1,733.89.

There was an expense incurred by rendering assistance to boats near the close of navigation in 1869, to the amount of \$345.

Superintendent's salary and clerk hire, \$1,550.

May 15th, boat W. F. Foot, loaded with coal, sunk on three mile level, caused by collision with another boat; navigation detained four hours. May 31st, boat W. S. Huntington, loaded with iron ore, sunk on three mile level, caused by stone displaced from slope wall and lodging on rock bottom of canal; navigation detained twenty hours. July 6th, boat Republic, loaded with wood, sunk on two mile level; cause, old and leaky; no detention. September 6th, boat C. F. Norton, loaded with lime, sunk on Glen's Falls feeder, caused by carelessness of persons in charge, running her into pier at head of five combined; navigation delayed twenty-two hours, on Glen's Falls feeder only. November 7th, boat J. Mercure, sunk on twelve mile level at mouth of feeder, caused by running her into vertical wall; no detention to navigation.

At least five feet of water has been maintained on each and every level on this section the past season, except five days in August during the week which was so exceedingly dry in this section of the State.

No serious delays have occurred to navigation besides those enumerated, except forty-eight hours, while twelve mile level was drawn off to raise boat sunk on another section, and twenty-four hours while mowing eel grass in Glen's Falls feeder, which grows so rank during the summer as to impede the flow of water, and generally requires the level to be drawn off twice during the season for the purpose of its removal.

Cost of new structures.....	\$21,314 86
Cost of repairs to old, including salaries.....	48,019 86
	<hr/>
	\$69,334 72

Inventory of boats, tools, etc., and materials on hand..	\$11,650 34
Miscellaneous receipts	1,164 88
	<hr/>

A considerable amount of work has been done upon this section during the year, under improvement and extraordinary repair contracts, the items of which will be found in the table annexed.

Wooden stop-gates should be put in at the foot of the Glen's Falls feeder. The Champlain canal is fed for fifteen miles south, and for ten miles north, from this point. In case of a break above or below, these stop-gates would be of great service in saving water and continuing navigation in the direction that the canal was uninjured. They can be inserted for about \$2,000.

**EXPENDITURES — SECTION No. 2, CHAMPLAIN CANAL — ORDINARY
REPAIRS.**

Drafts on Auditor.

Repair contract	\$14,628 75
Inventory, materials, tools, boats, etc.....	10,500 21
Certificate of deposit and interest	4,444 20
	<hr/>
Total paid repair contractor	\$29,573 16
Superintendent's expenditures	69,334 72
	<hr/>
Glen's Falls feeder (chargeable to repairs).....	\$98,907 88
Wrought iron bridge at Green's crossing, over Glen's Falls feeder (cost of old plan chargeable)	17,183 00
	<hr/>
Total ordinary repairs	\$116,540 88

EXTRAORDINARY REPAIRS.*Drafts on Auditor.*

Vertical wall and stop gate, Fort Edward.	\$8,228 00
Bridge at Fort Edward	1,188 12
Glen's Falls feeder guard lock (excess over old plan)	10,000 00
Wrought iron bridge at Glen's Falls feeder	1,181 85
Improvement Saratoga lock to Fort Miller lock.....	816 00
Improvement Fort Miller lock to Moses Kill lock.....	5,542 00
Improvement Moses Kill lock to Fort Edward lock	35,530 00
Aqueduct at Fort Edward.....	5,336 20
	<hr/>
	\$67,822 17
Engineering.....	5,000 00
	<hr/>
	\$72,822 17

Miscellaneous Expenditures.

Vertical wall at Glen's Falls feeder.....	\$1,924 42
Vertical wall foot of two combined locks at Glen's Falls feeder.....	2,163 97
Vertical wall above Fort Edward lock...	3,368 52
Vertical wall, and removing rock bottom at Sandy Hill	3,374 39
Land damages.....	1,347 00
Engineering.....	1,461 50
Advertising, etc.....	174 64
	<hr/>
Total extraordinary repairs.....	86,636 61
Award of Canal Board.....	\$21,530 37
Award of Canal Appraisers	1,215 00
	<hr/>
	\$22,745 37

SECTION No. 3, CHAMPLAIN CANAL.

GEORGE NORTHUP, Superintendent.

Extends from a point thirty-three feet south of the road bridge at Dunham's basin, to a point 300 feet north of the foot of the combined locks at Whitehall, a distance of twenty-two miles. The structures upon this section are eight locks; twenty-eight lock gates; five waste-weirs; two culverts; twenty-two farm bridges (wood); ten road bridges (wood); four tow-path bridges (wood); six foot bridges (wood); five watch houses; four dams across Wood creek.

The general repairs for the season upon this section have been thorough and extensive. The bottom of combined locks at Fort Ann has been newly timbered and planked, the walls pointed with cement, the valves and machinery repaired, the bottoms and walls of the Whitehall combined locks repaired, four new circular valves inserted, with new gearing and repairs made to Parish and guard locks, at a total cost of \$1,265.70.

The total cost of lock tending for the season has been \$2,687.61.

One new lock gate has been constructed and inserted in upper combined lock at Fort Ann, and extensive repairs made to all the other gates on the section, including painting, at a cost of \$742.63.

Smith's basin, Empey's, Eastman's, Blinn's, and Whitehall waste-weirs have been repaired, the cost of which was \$245.01.

A new change bridge has been constructed at Whitehall, two new foot bridges at Whitehall locks, new needle beams and floor timbers inserted in Fort Ann road and change bridges. The Whitehall road bridges have been painted, and nearly all the bridges on the section have been raised, together with the earth approaches, at an expense of \$2,453.43.

The State shop has been repaired at a cost of \$76.35.

Repairs have been made to the watch houses at Fort Ann, Parish, guard, and Whitehall locks, at a total cost of \$99.12.

New oak snubbing posts have been set above and below nearly all the locks on the section, at an expense of \$108.60.

The towing-path on the twelve and five mile levels has been raised, widened and graveled. The paved towing-path on Wood creek has been graveled its entire length, and the berme bank at Meeker's bend, on the twelve mile level, and near Whitehall railroad bridge, on the five mile level, has been raised and strengthened, at a total cost of \$5,894.82.

Repairs have been made to the dams on Wood creek, at an expense of \$437.88.

The prism of canal, on the twelve and five mile levels, has been cleaned out the entire length, to a uniform width of thirty-five feet on bottom, giving five feet depth of water, as contemplated by chapter 186, Laws of 1864; also, numerous bars removed from the channel of Wood creek, at a cost of \$11,512.47.

New slope and vertical walls have been constructed, and the old repaired on Wood creek, twelve and five mile levels, at a total cost of \$2,898.94.

New docking has been constructed and the old repaired on the twelve and five mile levels, and Wood creek, the cost of which was \$4,730.78.

July 4th, 1870, the boat "Bishop," loaded with iron ore, ran against bridge abutment at Smith's basin, and sank, causing a detention of forty-eight hours.

Competent watchmen have been employed day and night on the section, to watch the banks, at a cost of \$830.

The old lock-pit at Whitehall has been filled with earth to widen the towing-path, at a cost of \$282.80.

Postage, tools, superintendent's traveling and miscellaneous expenses, etc., \$437.09.

Superintendent's salary, \$1,100.

Clerk hire, \$450.

At least five feet of water has been maintained on all the levels on this section the past season, excepting five days during the dry weather in the month of August.

During the past year one break has occurred on this section (October 21, 1869), at Meeker's bend, on the twelve mile level, causing a delay of four days. It was caused by the heavy rains of that date, and was repaired by the repair contractor.

Cost of new structures.....	\$14,090 15
Cost of repairs to old, including salaries... .	<u>22,126 57</u>

\$36,216 72

Inventory.

Materials on hand	\$7,814 56
Boats, tools and implements	<u>2,220 34</u>

\$10,034 90

Miscellaneous receipts, \$25.

The work done under the improvement, and other contracts, on this section, chargeable to extraordinary repairs, will be found stated in the annexed table.

The improvement contracts on this and section No. 2 have been running several years, and should be terminated.

A new iron bridge should be built at Fort Ann. The Whitehall harbor, at the foot of the locks and other points, has been greatly improved by dredging during the summer.

EXPENDITURES — SECTION No. 3, CHAMPLAIN CANAL.*Ordinary Repairs—Drafts on Auditor.*

Repair contracts	\$11,611	45
Inventory, materials, tools, boats, etc ...	5,520	73
Certificate of deposit and interest	4,705	46
	Total paid repair contractor	\$21,837
	Superintendent's expenditures	36,216
Total ordinary repairs		\$58,054 36

Extraordinary Repairs—Drafts on Auditor.

Dredging Whitehall basin.....	\$15,011	00
Digging ditch at Wood creek.....	211	20
Improvement, section 2, twelve mile level.	23,137	00
Improvement, section 3, twelve mile level.	31,705	00
Raising and lining tow-path on Whitehall level	5,350	20
Whitehall level.....	17,034	00
Farm bridge of G. F. Dudley.....	231	28
Whitehall Pier	1,444	68
Raising road bed adjacent to Wood creek	9,632	00
Improving the narrows on Wood creek..	1,380	64
Raising and paving towing-path on Wood creek, from lower lock at Fort Ann to the narrows	7,357	40
Raising and paving towing-path on Wood creek, from Parish lock to guard lock..	17,565	00
Engineering.....	6,300	00
	\$136,359	40

Miscellaneous Expenditures.

Improvement, Wood creek	482	75
Vertical wall, Ames' mills, Whitehall...	314	56
Docking at Fort Ann	2,289	05
Land damages.....	1,410	00
Engineering.....	295	27
Advertising, etc.....	362	88
	Total extraordinary repairs.....	141,513 91

BLACK RIVER CANAL.

SECTION No. 1.

JOHN COLE, Superintendent.

Extends from the junction of the Black River canal with the Erie canal at Rome, to a point on the summit level, one thousand feet north of lock No. 70, including the delta feeder, and is twenty-four miles in length.

The structures upon this section are seventy locks (lift); one guard lock (on delta feeder); five aqueducts; five waste-weirs; ten culverts; fifteen road bridges (two iron); seventeen farm bridges; two draw bridges; two change and road bridges; twenty lock houses; sixteen watch houses; two dams, one at Delta, on the Delta feeder, and one between locks Nos. 33 and 34.

Since the first of January, 1870, the following locks have been repaired at a cost of \$3,708, viz.: Locks Nos. 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13, 14, 15, 16, 17, 19, 21, 22, 23, 24, 27, 28, 32, 33, 35, 38, 39, 41, 42, 43, 45, 49, 51, 52, 55, 56 and 57.

The lock walls of nearly all the locks on this section are built from a poor quality of stone, and the mortar has been washed out by the leakage. They require repointing and frequent repairs.

The expense for lock tending was \$6,240.66.

There have been seventy-two lock gates built and inserted at the following locks, viz.: One each at locks Nos. 3, 9, 17, 19, 21, 23, 26, 27, 28, 30, 31, 40, 46, 50, 52, 53 and 64; two each at Nos. 4, 6, 8, 14, 18, 20, 32, 34, 35, 39, 43, 51, 54, 67, 68 and 70; three each at Nos. 12, 48, 49, 55 and 62; four each at Nos. 11 and 13, at a cost of \$7,899.44. Also repairs made to all other gates on the section, except those at Delta feeder, at an expense of \$3,185.16, making a total cost of new and repairs to old the sum of \$11,048.60.

Extensive repairs have been made to the wood trunk of Wells' creek aqueduct, a portion made new, with additional supports, at a cost of \$1,050.88.

The waste-weirs between locks Nos. 47 and 48, 62 and 63, and the one on the summit level, have been repaired at a cost of \$239.85.

The stone culverts between locks Nos. 20 and 21, and 30 and 31, have been repaired at a cost of \$283.

Two new bridge superstructures have been built, known as Wilcox's and Adams', and extensive repairs made to the following, viz.: Farr's, Comstock's, Huntington's, Wadsworth's, Elmer hill, Floyd hill,

Brayton, Wright's, Goodwin's, Beckwith's, Utley's, Brick hill, Waldo's hillside, Diefendorf's, Rogers, Westerville and Rome, at a cost of \$3,037.22.

The twenty lock-houses upon the section have been nearly all shingled and repaired at a cost of \$1,462.10.

Sixteen new watch-houses have been constructed at locks Nos. 3, 4, 5, 18, 21, 25, 28, 32, 35, 47, 49, 51, 56, 58, 65 and 68 at a cost of \$937.03.

There has been expended the sum of \$684 to protect and guard against land slides between locks Nos. 31 and 32, 50 and 51, and 52 and 53.

Raising and repairing the tow-path and berme bank on the different levels, and between the locks, has cost \$2,380.42.

The prism of the canal has been well cleaned out, nearly its entire length, at a cost of \$4,949.03.

The cost of making slight repairs to docking at different points was \$254.36.

Watchmen have been employed at the most dangerous points to guard against breaks, at a cost of \$340.

No breaches have occurred of sufficient magnitude to interrupt navigation.

The boats "Cook" and "Highlander" sank, the former near lock No. 24, the latter near lock No. 23.

There were no delays to navigation except those occasioned by lock-gates giving out, being three days in all, and not exceeding one day at any one time.

The average depth of water maintained on the lower miter sills at each of the locks was four feet ten inches.

Miscellaneous expenditures, not above enumerated	\$1,603 38
Expended for new work	10,508 98
Expended for old work, salaries, etc.,	29,395 55
	<hr/>
	\$39,904 53

Inventory.

Materials on hand	\$921 50
Boats, tools and implements	1,127 81
	<hr/>
	\$2,049 31

EXPENDITURES SECTION No. 1, BLACK RIVER CANAL.—ORDINARY REPAIRS.

Drafts on Auditor.

Repair contract.....	\$5,343 00
Break account.....	7,725 69
Extra work, repair contract.....	13,342 19
	<hr/>
	\$26,410 88
Inventory, materials, tools and boats....	4,313 48
Certificate of deposit and interest	4,864 95
	<hr/>
	\$35,589 31

Miscellaneous.

Extra work, repair contract.....	157 41
Total paid repair contractor.....	\$35,746 72
Superintendent's expenditures	39,904 53
Total ordinary repairs	<hr/> \$75,651 25

EXTRAORDINARY REPAIRS.

Drafts on Auditor.

Engineering.....	\$300 00
Iron road bridge at Floyd street, Rome .	1,615 00
	<hr/> \$1,915 00

Miscellaneous Expenditures.

Engineering	248 00
Advertising, etc.....	22 75
Counsel before Canal Appraisers.....	215 00
Total extraordinary repairs	<hr/> 2,400 75
Awards of Canal Appraisers.....	2,500 00
	<hr/> <hr/> \$80,552 00

SECTION No. 2.

R. SANFORD MILLER, *Superintendent.*

This section extends from a point on the Summit level, 1,000 feet north of lock No. 70, to Black river, below lock No. 109, a distance of twelve miles; including, also, the Moose river improvement, above the dam at Lyon's Falls, one mile and a half; the Boonville feeder to Forest Port, ten and one-half miles; the Black river, above the dam at Forest Port, two miles; and also, the North Branch, South Branch and Woodhull reservoirs.

The structures on this section are: Thirty-nine lift locks; one guard

lock twelve lock houses; three watch houses; one State shop; one timber shed; two keepers' dwelling-houses, one each at North Branch and Woodhull reservoirs; two dams on Black river; one aqueduct; six waste-weirs; ten culverts; two stop gates; sixteen road bridges; one iron chord bridge; twenty-one farm bridges; one road and change bridge; one farm change bridge; one tow-path bridge.

Of these structures the following are new, having been constructed within the past fiscal year: New road bridge at Hawkinsville, cost \$600; new road bridge at Kimball's, cost \$875; new road bridge at Lee's, cost \$400; new farm bridge at Miller and Willard's new abutments, \$400; new abutments to Jackson bridge, \$175; new abutments to Lobdell's bridge, \$175; new floor timber, plank and approaches to McVicker's bridge, \$400; new floor to iron chord bridge over Black and Moose river, \$400; new cellars to lock houses Nos. 72 and 85, \$100; three new watch houses at locks Nos. 72, 95 and 98, about \$50 each, \$150; three hundred feet new docking, five feet high, below lock No. 92, \$283.30; sixty new lock gates, at a cost of \$8,312.01; new plank on tow-path of Sugar river aqueduct, \$77. New docking has been built under fifteen bridges, at an aggregate cost of \$347.92.

A new road bridge (wood) in Port Leyden, built by contract, is completed.

A new iron bridge at Schuyler street, Boonville, under contract, has been since completed.

The lock gates have been repaired in thirty-seven locks, being Nos. 72 to 109, except No. 92, which has four new gates, at a cost of \$3,650.

Repairs to locks Nos. 73, 74, 85, 95, 96, 97 and 101, including the embankments and sluices around the locks, have been made at an expense of \$690.

Lock houses at locks Nos. 73, 81, 85, and at guard lock, have been thoroughly repaired by putting in new floors, ceiling, plastering, and some new roof and covering, at an aggregate expense to the State of about \$1,203.

All bridges on the section here have been repaired by putting in some new chords, new needle beams, and generally replanking, wholly or in part, at an aggregate expense of \$1,850.

At North Branch Reservoir the heavy snow in the fall of 1869 prevented the finishing and testing of the new dam then erected, and during the past season the dam has been strengthened and loaded with several hundred tons of stone, an apron constructed below the sluices, the gate stems taken out and refitted, new slope wall made on

the face of a portion of the embankment, and the new chute or spill-way finished and cleaned out at an aggregate cost of \$3,942.76.

North Branch flows 500 acres, can be raised twenty-eight feet, and filled twice in a year. It is now drawn off for safety, but can be filled after the spring freshets.

At South Branch Reservoir, where the upper portion of the well timber had become so decayed as to be worthless and unsafe, the wall and embankment around the well were taken up, the decayed timbers taken out and new put in its stead, the earth and wall replaced, the valves and rods refitted, the well caulked, and the whole work put in good condition at an expense of \$1,073.34. South Branch flows about 600 acres, and can be raised twenty-five feet. It now contains about fifteen feet of water.

The bulk-head, pipes, and gates of Woodhull reservoir are being rebuilt on a change of plan, in a very complete and permanent form. The superintendent has expended for opening a road to the reservoir, "eight miles through the woods," and in erecting such buildings as are necessary for keeping the men engaged on the work, the sum of \$3,696.80. This reservoir has not been filled to a depth of over eight or ten feet for several years, owing to the dilapidated and dangerous condition of the wooden discharge pipes and bulk-head. An appropriation of \$2,500 was made by the Legislature of 1870, to pay the difference in cost between wood and iron pipes for this reservoir, the balance of the cost of reconstruction to be paid from ordinary repairs. Two iron pipes, nearly 100 feet in length, thirty inches inside, diameter, with Ludlow's patent valves, or stop-gates, have been put in by the Commissioner in charge. The pipes have been laid in masonry and cement, with stone well house, wooden head gates, etc., and the whole work done in the most thorough and substantial manner.

This reservoir flows nearly 1,200 acres, and can be filled eighteen feet above the pipes. It contains now about eight feet of water. The expense of reconstruction has been large, but there can be no doubt of the duty of the State, in storing this large quantity of water, to take every possible precaution to protect its own property, and that of its citizens below, from the calamity of a Black river flood, that might exceed, in its terrible consequences, the great freshet of 1869. Further work upon the slope wall, embankment, and spillway, will be done in the spring, and the whole work permanently completed.

The total amount paid upon this work by the Commissioner in charge, up to September 30th, has been the sum of \$2,782.82.

The waste-weirs on this section are in good repair, some new gates have been put in them at an expense of \$30.

The feeder for its entire length, ten and one-half miles, was well bottomed out the past spring, the cost of which was \$2,583.38.

The canal from Boonville to Lyon's Falls, ten miles, was thoroughly bottomed out, at a cost of \$2,527.

The towing-path has been raised and graveled for a distance of two miles between Boonville and Port Leyden, and has been particularly raised and graded around the several sets of combined locks.

Four small breaks have occurred, but were so promptly discovered as not to be serious, or to cause in any case but a few hours' delay. They all occurred in the vicinity of Sugar river, and all originated from sink holes in the stratified limestone. This portion of the canal requires constant care and watchfulness to insure safety to the banks, and at all times there is a great waste of water, lost by escaping through crevices in the rock bottom. The aggregate cost of repairing all the breaches was \$178.

A portion of the tow-path bank below lock No. 95 was found to be sinking and sliding out, which done, would have caused a serious breach; but promptly strengthening the back of the bank with brush and stone, made all secure at a cost of \$220.60.

Only three boats have been sunk on this section during the season, and those poor and old, and sunk from carelessness of men running them. No delay was caused to navigation, except half a day in one case, the boats having been raised and sent to dry dock, at an expense of about \$45.

There has been but one full day's delay to navigation during the season, which was occasioned by the breaking out of an old lock gate, in lock No. 102, opening into Black river.

The water has been four feet deep through the season on the lower miter sills of all the locks except in No. 102, where it run down to three feet six inches, before flash boards were put on the dam at Lyon's Falls.

The past season has been a particularly dry one, making it necessary to be very careful and economical in the use of water for feeding the canal. At the guard lock at head of feeder, Forest Port, excellent care has been taken and no water wasted. Water was first fed from Woodhull reservoir June 9. All was used from Woodhull (which, from its unsafe condition, was only allowed to fill ten feet) first, from South Branch next, and after that was used North Branch

was opened ; but at the close of the season there was ten feet of water in North Branch reservoir.

In one point of view, the items of expenditure for bottoming out the Forest Port feeder, as well as all the cost of the reservoirs, should be chargeable to the Erie canal.

There is plenty of water in Black river to run the Black River canal, without any reservoirs, and without running so strong a current as to cause the formation of bars in the feeder.

The aggregate of these charges by the superintendent for the feeder and reservoirs, from January 1, 1870, to October 1, 1870, is \$11,296.68, which, being in no part for the exclusive benefit of the Black River canal, is not strictly a charge upon its cost of maintenance.

Clerk hire.....	\$600 00
Superintendent's salary	1,100 00
<hr/>	
Cost on new structure	\$18,552 93
Cost of repairs to old, including salaries.	22,598 40
	<hr/>
	\$41,151 33
<hr/>	

Inventory.

Materials on hand.....	\$2,316 60
Boat tools, implements, etc.....	1,352 40
	<hr/>
Total.....	
Total.....	\$3,669 00
<hr/>	
Miscellaneous receipts	\$193 45
	<hr/>

The iron bridge at Boonville and the wooden bridge at Port Leyden have been completed.

EXPENDITURES SECTION NO. 2, BLACK RIVER CANAL.—ORDINARY REPAIRS.

Drafts on Auditor.

Repair contracts	\$2,593 50
Break accounts	49,887 49
	<hr/>
Total.....	\$52,480 99
Extra work, repair contracts	10,163 78
Certificate of deposit and interest.....	4,864 95
Inventory, materials, tools and boats....	3,819 40
	<hr/>
Total.....	\$71,329 12

Miscellaneous.

Extra work, repair contractor.....	\$125 00
Total paid repair contracts	\$71,454 12
Superintendent's expenditures	41,151 33
Cast iron discharge pipes at Woodhull reservoir.....	282 32
Total ordinary repairs.....	\$112,887 77

EXTRAORDINARY REPAIRS.*Drafts on Auditor.*

Beaver creek bridge.....	\$4,000 00
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Miscellaneous Expenditures.

Cast-iron discharge pipes at Woodhull reservoir.....	2,500 00
Engineering.....	736 00
Advertising, etc.....	691 63
Counsel fees, printing and engineering expenses, defending Black river claims,.....	11,318 91
Total extraordinary repairs.....	19,246 54
Award of Canal Board.....	7,500 00

SECTION No. 3, BLACK RIVER CANAL.**FRANK B. JOHNSON, Superintendent.**

This section extends from Lyons Falls to Carthage, a distance of forty-two miles, and includes the Black River improvement.

The contract for repairs of this section was let to Israel G. Wood, February 16th, 1869, for four years and ten months, and was subsequently assigned to Ward and McVickar, and was surrendered and canceled April 13th, 1870, since which time this section has been kept in repair by the State, under the direction of the superintendent.

Structures on section: One road bridge at Carthage (iron); one drawbridge at Illingsworth; one at Beach's; one at Tiffany's; one at Whittlesey's; one lock and dam at Beach's Landing; one lock and dam at Otter Creek, and a dam at Carthage; two lock houses; three bridge houses, and five docks.

A lock house has been built at Beach's lock, at a cost of \$459.80; and a bridge house at Illingsworth bridge, at a cost of \$459.80.

The bridges on this section, in April, 1870, were all in bad condition; the draws did not turn well, the floor timbers were decayed, and planking worn and unsafe; Carthage, Tiffany's and Whittlesey's

destitute of paint. They have all been repaired and painted, at a cost of \$1,448.07.

The lock at Otter Creek was in very bad condition; the head blocks, planking, and part of the timber, decayed and unsafe. The lock at Beach's Landing was, in many respects, out of repair. They have both been repaired, at a cost of \$842.65.

The vertical wall at Beach's lock was damaged by the flood, in the spring of 1869. It has been repaired this season, at a cost of \$150.62. The slope wall below the lock was undermined and fell in the river. It was relaid at a cost of \$121.40.

The lock house at the lock and dam at Otter Creek, and the bridge houses at Tiffany's and Whittlesey's bridges, were destitute of paint; they have been repainted and other slight repairs, at a cost of \$71.77.

The Carthage dam leaked badly, and was repaired, by removing an old coffer dam, with the dredge and State scow, at a cost of \$290.74.

The dock at Illingsworth bridge is an important and extensive one, and was very much decayed; it has been rebuilt this season, at a cost of \$628.41.

The channel of the river has in many places been filled with bars, occasioned by the flow of creeks into and bends in the river. The excessive drought of the past season rendered the water so low that many bars, which have not caused trouble before in several years, had to be removed. The State dredge on this section has been kept in constant use since April 28, and running for fifteen hours per day for over ninety days. Navigation has been maintained at all times on the entire section, at a cost for dredging of \$8,671.74.

There has been a State scow built (including cabin and repairs), at a cost of \$442.27.

The following other expenditures have been made:

Lock and bridge tending.....	\$641 34
Miscellaneous	353 83
One small boat	12 50
Clerk hire	450 00
Superintendent's salary	1,100 00

Cost of new structures.....	\$1,360 10
Cost of repairs to old, including salaries...	9,786 84

\$11,146 94

ANNUAL REPORT OF THE

Inventory.

Materials on hand.....	\$30 00
Boats, tools, implements and dredge	11,253 50
	<u><u>\$11,283 50</u></u>

The Parker's Landing bridge is in progress, but it is believed that the appropriation is not sufficient to complete the bridge. A further appropriation by the Legislature, or some action of the towns most interested, will be necessary to finish the work.

EXPENDITURES ON SECTION No. 3, BLACK RIVER CANAL.—ORDINARY REPAIRS.

Drafts on Auditor.

Repair contract	\$4,404 18
Inventory, materials, tools and boats	11,431 57
	<u><u></u></u>
Total paid repair contractors.....	\$15,835 75
Superintendent's expenditures	11,146 94
	<u><u></u></u>
Total ordinary repairs	\$26,982 69

EXTRAORDINARY REPAIRS.

Drafts on Auditor.

Bridge at Parker's Landing	\$6,698 00
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MISCELLANEOUS EXPENDITURES.

Engineering.....	152 00
Advertising, etc.....	41 13
	<u><u></u></u>
Total extraordinary repairs.....	6,891 13

GENERAL REMARKS.

ORDINARY REPAIRS.

From these statements of the amount of work done during the fiscal year, it will be seen that the responsibility has been assumed, of making the large expenditures necessary, to restore the canals of this division, as fully as was possible in one season, to that condition of safety, efficiency and usefulness which was demanded by the commercial interests of the country, and which sound public policy as well as the duty of the State required.

The canals of this State were devised by a far seeing statesmanship, that recognized and acted upon the great truth, that cheap freights are as necessary as wise laws, for the full development of its natural advantages and its material resources, and for promoting the prosperity of its people.

The State, in entering upon this great scheme of public improvements, necessarily exercised its most imperial powers over the rights and property of its citizens. So great an exercise of power can only be justified by the beneficent purpose for which it was undertaken, and by the faithful discharge forever after, of every duty and obligation which it assumed, in embarking upon this great enterprise.

First among these obligations, it has pledged its faith to their safe and proper maintenance. The State builds canals, and holds out certain inducements to commerce. It promises *cheapness, safety and certainty of time* for the movement over its canals, of the valuable products of our own and of other States. It invites and secures this traffic exactly in proportion to the fidelity with which it fulfills these promises. That freight should move cheaply, safely and with regularity, are the three indispensable conditions to the success and usefulness of any system of cheap transportation.

In no way can these essentials be secured, unless those in the immediate charge of the repairs and navigation of the canals fairly fulfill these obligations to commerce, by putting and keeping the canals of the State in a good, safe and navigable condition.

The construction of the canals through the fertile valleys and the thriving towns and cities of the State, and for the greater part of the distance upon this division, upon a level higher than that of the adjacent lands, also imposes upon the State the duty of carefully guarding its banks, of properly maintaining all its structures safe for public use, and of averting wherever it is possible, by every reason-

able precaution, both the delays to navigation and the loss of private property caused by floods and accidents.

The vast number of awards made by the Canal Appraisers, for damages to property, occasioned by the neglect of this duty in former years, testify to its importance, and the large amounts already paid for such purposes, should be added to the cost of the system of repairs under which these casualties happened.

In attempting to discharge the duties connected with the ordinary repairs upon the Eastern Division, during the past season, starting from the general dilapidation incident to the late repair contract system, and the destruction to the property of the State, caused by the floods of 1869, an unusual outlay has been required, but the record of good navigation, and the improved condition and safety of its canals, at the close of the fiscal year, will, in my opinion, commend and justify all the expenditures.

If the management of public enterprises is to be judged by its results, it is gratifying to note that the season of navigation for 1870, upon all the canals of this State, has been marked by no serious interruptions, and that the average time of passage of loaded boats, has been lessened several days from Buffalo to Albany, and upon the lateral canals in still greater proportion.

These are the best evidences that can be afforded, that a system of thorough repairs, with liberal facilities for navigation, protection to persons and property passing over the canals, and constant watchfulness against disasters, although expensive at first, is the wisest, safest, and will be eventually the most economical policy of canal management that the State can pursue.

The present good condition of the canals upon this division, warrants the prediction, that the cost of ordinary repairs and maintenance of good navigation for the present fiscal year, will be less than one-half that of the past fiscal year.

And when the dams and locks in process of construction on the Champlain canal, and the work upon the Erie canal feeders, on Black river, the greater part of which is paid from ordinary repairs, shall have been completed, the total cost, per year, of ordinary repairs on the Eastern Division can be still further materially reduced. Of course it is possible to stop all work of protection and safety, and all repairs that would be warranted by a sound business judgment in the management of the property of an individual and corporation, and confine the expense and management of the canals to the simple duty

of furnishing navigation, by flooding the levels, endangering the banks and structures, and running the daily risk of breaks.

This was the policy pursued, upon this division in 1868, which is often quoted by the opponents of the present canal policy, as a memorable year of good management, but the dilapidated and defenseless condition in which the canals were left to meet the floods of 1869, and the ruin and disaster to the canals, and the commercial interests of the State which followed, and the cost of reparation, which is included in the expenditures for the past fiscal year, are rightfully chargeable to that policy of management. While every effort will be made to diminish the expenditures for the present fiscal year, no duty will be neglected to promote the permanent welfare and usefulness of the canals.

REPAIR SYSTEMS.

The Legislature of 1870, by its wise legislation upon canal matters, inaugurated many important reforms. It abolished the Contracting Board, and made provisions for the surrender and cancellation of the existing contracts, and for the proper enforcement of all the terms and conditions of those remaining in force. This action restored the Canal Commissioners, in charge of their respective divisions, to all their former power and control over ordinary repairs, and revived upon the sections not under contract, the system of making and paying for repairs by the superintendents.

The annexed table of "ordinary repairs," will show the comparative and the total expenditures made under the "contract," and the "superintendent" system during the fiscal year.

It will be seen that a statement of the total annual compensation, upon the repair contracts, gives no correct idea of the actual cost to the State of that method of repairs. All break accounts, extra work, and awards of all kinds made to repair contractors, and all necessary work outside the contract, and the salaries and expenses of superintendents are paid from ordinary repairs, and are properly chargeable to that system. The superintendent's accounts when the section is not under contract, include all these additional items.

There was paid to the repair contractors, upon the ten sections of this division, which were surrendered on the 1st or 15th of April, 1870, for monthly compensation, break accounts, and extra work, from October 1st, 1869, to the date of their surrender, not including inventories taken and certificates of deposit returned, the sum of \$346,159.38.

To this sum must be added the expense of superintendents, and for work outside of their contracts, for the same period of time, which was \$21,361; making a total expenditure for ordinary repairs under the contract system, during the fall and winter months, of \$367,520.38, while the total expenditures by superintendents during the same length of time, but from April to October 1st, 1870, including the whole cost of spring repairs and maintenance of good navigation for nearly five months, and expenses of all kinds, has been the sum of \$467,965.82.

Compare the amount of work done upon this division, under the two systems, in the same year, and the result is overwhelmingly in favor of the economy as well as the efficiency of the latter system.

The present superintendent system is not a perfect one, and should be modified in many matters of form and detail, in reference to the purchase of materials, and the auditing and paying of accounts. But no system can dispense with the valuable services of an officer of character and intelligence, who shall have the special supervision of the repairs and the navigation of the section under his immediate charge, with wide discretion and full powers in sudden emergencies and disasters, and responsible directly to the commissioner in charge for the good management of his section.

By chapter fifty-five, Laws of 1870, the Canal Board was authorized "to devise the method or system by which the repairs of the canals shall be made and its management conducted."

It was not thought best, in view of the large amount of work necessary to be done, to make any changes in the present method during the fiscal year; but from the plans now under consideration, there will probably be a new or modified system adopted for the guidance and control of superintendents during the season of 1871.

In my judgment, the present system should be modified in the following respects:

1. The superintendents should be appointed by the Commissioner in charge to hold office during his pleasure. This will remove the office, to a certain extent, from the domain of politics, and make the office independent of local influences, and responsible only to the appointing power.

2. Superintendents should make their estimates for each month for the work to be done on their section, the amount of which, when approved by the Commissioner, should be advanced to the Commissioner, and by him deposited in the bank selected by him upon that section, which will furnish currency when required.

3. Stringent regulations should be made that all purchases of materials amounting to over \$100 in value should be by written contract, on a printed form, to be furnished, which should require the Commissioners' approval, within ten days, to make it valid.

4. Direct and require that the superintendent shall forward weekly report of check rolls, duly verified, with prices to be paid, by mail, to the Commissioner's office.

5. On the first of every month the superintendent and his clerk, shall prepare all accounts for settlement, and forward them promptly to the Commissioner, for examination.

6. The Commissioner or his general paymaster shall examine these accounts promptly, and mark each item "pay," "suspended," or "disallowed."

7. There shall be appointed upon each division a general paymaster and two or three assistant paymasters, who shall give bonds, and be subject to the direction of the Commissioner. The general paymaster only to have power to audit and allow accounts, in case of the absence of the Commissioner.

8. Upon the accounts as audited and allowed, the paymasters shall proceed at once to the sections to which they may be assigned, go over each section and pay as directed, in presence of the superintendent, from funds drawn by check from the bank upon that section, to the persons named in the vouchers. Certain advances may be made by the Commissioner to the superintendent, for paying accounts less than \$100, and for advances necessary to be made for labor during the month, all of which must be settled and adjusted by the paymaster before leaving the section. On leaving, the balance of funds on hand for that section, to be redeposited, and the accounts and vouchers forwarded to the Commissioner.

9. Every month the accounts and vouchers for all the sections to be certified to, as correct by the Commissioner and delivered over to the Auditor, who shall audit them within ten days.

EXTRAORDINARY REPAIRS.

Most of the work deemed necessary to be done during the coming year, as extraordinary repairs, for which appropriations are asked, has been specified in the preceding statements for each section.

On the Erie Canal, the removal of the wall bench with the construction of new slope and vertical walls and pavement on the tow-path side, is the most important duty yet to be performed, to secure

better navigation and to complete the plan of the Erie enlargement.

There is still remaining on the Eastern Division, not under contract for removal, nearly thirty-six miles of old wall bench on the tow-path side, located as follows:

From Wood creek to Newville through Rome.....	2.50	miles.
" Utica to Little Falls.....	12.00	"
" Little Falls to Sprakers	15.50	"
" Fultonville to Lock 23.....	5.80	"
	<hr/>	
	35.80	"
	<hr/>	

A further appropriation of at least one hundred thousand dollars, is necessary for the prosecution of the work now in progress and for new work of this kind at points where it is most needed.

The whole amount of appropriations, recommended for extraordinary repairs on this division, is less than one-third of the amount provided for last year under the provisions of chapter 877, Laws of 1870. Some of the amounts appropriated by chapter 767, Laws of 1869, where the work has not been begun or completed, should be reappropriated.

Under the repair contract system a very strict construction obtained as to the meaning of the words "ordinary repairs," which, in reference to repair contracts, at least, were held to mean the reparation, and the reconstruction, when necessary, of any of the structures of the canals, upon precisely the same plan, as that upon which the work had been originally constructed, and in case of any deviation from that plan, the increased cost was claimed to be an extraordinary repair. And as under that system, the commissioner had but little power to do any work of repairs except through the repair contractors, no important improvement in the plan of repairs of any portion of the canals, however necessary or valuable, that involved an increased cost, could be undertaken by the State, unless it was specially provided for in an extraordinary repair bill.

These and other reasons, led to the annual passage of extraordinary repair laws, making large appropriations, to be paid by a direct tax on the people.

Under the present system of making ordinary repairs, the necessity for many of these appropriations, will no longer exist. All new work for the purpose of enlargement or improvement of any portion of the canals of the State, or new structures where none existed

before, must still, in the discretion of the Legislature, be authorized and provided for in this manner.

But there can be no good reason, why the State of New York, on resuming possession of its canals, cannot make use of all the improvements in the plans of structures, and in the durability of materials to be used in repairing and rebuilding its public works, that are suggested by science and experience, and pay for the same as "ordinary repairs," from the revenues of the canals, instead of classing them as extraordinary repairs, and imposing their cost directly by tax upon its citizens.

Any other construction will confine all ordinary repairs to a Chinese policy of imitation, unworthy of the State, hostile to all progress, and unadapted to the wants of the canal, and will keep alive the necessity for annual appropriations for extraordinary repairs.

SUPPLY OF WATER.

Notwithstanding the extraordinary drouth and low water which existed during the whole season of 1870, but little detention to navigation from low water has been experienced upon this division.

All the feeders supplying the Rome level, by agreement with the commissioner of the Middle Division, were put in the general charge of an agent, appointed for that purpose, to whose judicious management, with that of the superintendent's in the immediate control of the feeders, great credit is due, for averting the anticipated danger of a partial suspension of navigation.

There has been a further investigation of the sources of supply of water for this level and of many proposed feeders and reservoirs for furnishing an additional quantity of water when required.

Fish Creek feeder offers the largest supply, and although an expensive work, it must in time be built, to meet the wants of the eastern portion of the Rome level. The present need is for water upon the western portion, but the opening of the Oneida Lake canal will make a further diversion of the present resources of this division, that will call for prompt action upon this important subject.

It became necessary, in August last, to get an additional supply of water for the Glen's Falls feeder on the Champlain canal, from the lakes and ponds above, whose waters flow into the North and Sacandaga rivers, by which means navigation was kept up nearly two weeks, until rains raised the river to its usual height. This necessity was caused by the leaks in the feeder, through the crevices of the

limestone through which this portion of the feeder is cut, and from the dilapidated condition of the dam at the head of the feeder. This dam has been built many years, and cannot be made safe against freshets, or sufficiently tight in low water to supply the feeder. After a careful examination, I am satisfied that this dam should be rebuilt as speedily as possible.

This work done, there can be no question as to a complete supply of water for the Champlain canal, upon any plan of enlargement that may be adopted, as the facilities for valuable and extensive reservoirs on the streams above are cheap and boundless.

CHAMPLAIN ENLARGEMENT.

Chapter 788, Laws of 1870. "An act to provide for and making an appropriation to enlarge the Champlain canal," appropriated the sum of \$25,000 for the purpose of making the necessary surveys, maps, plans and estimates for "the enlargement of the Champlain canal, in such manner as to give throughout the entire length of such canal a uniform depth of seven feet of water, and width of forty-four feet on the bottom, and fifty-eight feet at water surface, except as in the opinion of the Canal Board may be required for business purposes, when in that case the walls way be made vertical, but retaining the same depth of water and width at water surface."

Section three of this act made it the duty of the State Engineer and Surveyor to make or cause to be made the necessary surveys, maps, plans and estimates of this proposed enlargement.

In June last, pursuant to directions from the State Engineer, the Division Engineer, E. H. Crocker, Esq., organized two parties for making the necessary surveys.

The following extracts from the able report of the Division Engineer, lately made to the State Engineer, on this subject, shows the amount of work done, and the most important facts determined by the survey:

"In obedience to your directions, two parties were accordingly organized, and entered upon duty the first day of July last, one in charge of S. E. Babcock, Esq., on that portion of the line extending from its junction with the Erie canal at West Troy to the south end of Fort Miller bridge, above Schuylerville; the other in charge of Wm. B. Cooper, Esq., on that portion extending from Fort Miller bridge to the village of Whitehall.

"Both parties were assiduous in the prosecution of their respective charges, and closed their field work in the early part of December, at

which time several of each party were discharged, those only being retained whose services were necessary for the office work on maps, plans, estimates, etc."

The method of survey has been in accordance with that prescribed in the established regulations. As a general thing the line of the new survey coincides with the old line, departures being made only when the line could be straightened and improved, and as economically built.

The maps, plans and estimates which I herewith respectfully submit for your examination have been prepared with great care and precision and may be relied on for accuracy, and hence are invaluable, especially the maps, for future reference and use, even in the event of not immediately proceeding with the enlargement.

By reference to the abstracts of estimated quantities and prices it will be seen that the estimated cost of enlarging the Champlain canal throughout its length to the dimensions prescribed in the act is as follows:

	Distance in miles.	Cost.
First division, extending from junction at West Troy to south end of Fort Miller bridge	29.76	\$1,520,345 27
Second division, extending from south end of Fort Miller bridge to Whitehall 33.88	<hr/>	1,330,229 45
Total.....	<hr/> <hr/> 63.64	<hr/> <hr/> \$2,850,574 72

This estimate covers everything except the cost of constructing two lift locks in place of the "three locks," north of Waterford, the major portion of the cost of which will be chargeable to the revenues. The remainder, it is expected, will be provided for this winter by tax. Also the enlargement of the guard lock on Wood creek, five miles south of Whitehall, at a cost over old plan of not to exceed seven thousand dollars.

In connection with this a survey was made to ascertain the cost of constructing an independent line of canal outside of Wood creek, extending from the lower lock at Fort Ann village to the guard lock north, a distance of six (6) miles.

To construct this line and make it entirely independent of the said creek will involve the construction of one aqueduct, two lift locks of three feet each, one dam and bulk-head and a feeder a half a mile long, four road bridges, four farm bridges, one change bridge, one

railroad bridge, two box culverts and an appropriation of about ninety acres of land, at an estimated cost of \$364,400; estimated cost as per old line, with proposed improvements, as shown on map, is \$8,775; excess, \$283,625. It would also be necessary to occupy about one mile of the Rensselaer and Saratoga railroad line, and throw the same parallel with itself westward.

This independent line, if built, would be free from the frequent annoyances and delays occasioned by high water, and much less expensive to maintain, and would possess otherwise many advantages.

The plans and specifications for the mechanical structures are generally similar to those adopted for the enlargement of the Erie canal, varying to correspond with the breadth of prism and with a view to economy; varying as regards masonry, in the character of the work.

The locks on this canal consist of twenty-three lift (including the three side-cut at Waterford) and four guard and one weigh locks, which have been enlarged to the size of the Erie locks, except Flynn's, four and a half miles north of Waterford, and the guard lock on Wood creek, five miles south of Whitehall. Provision has been made for rebuilding Flynn's lock on the enlarged size, and it is now under contract, to be completed on the first day of May next.

The "three locks" need rebuilding immediately, and, when done, it is designed to dispense with the middle one and construct only two, with equivalent lifts. The only one then remaining to be enlarged will be the guard lock on Wood creek, which can be done at a trifling cost.

The weigh lock at Waterford, constructed in the winter and spring of 1861-2, was built to accommodate the largest class of Erie canal boats. Hence, on the first day of May next, there will remain to be enlarged only one guard and two lift locks.

AQUEDUCTS.

There are now four small aqueducts on the old canal. One of them has been built with reference to enlargement and the other three, with slight alterations and at a nominal expense, can be adapted to the proposed prism.

It will be necessary, in order to secure sufficient water way for the stream just below Flynn's lock, to convert the culvert now there into a small aqueduct with one span only. Act chapter 767, Laws of 1870, provides for an aqueduct at Wilbur's basin or creek, and

appropriates twenty thousand dollars to pay the cost of construction. This will be built on the enlarged size perhaps within the next eighteen months.

CULVERTS.

There are, on the present old canal, nineteen culverts, eleven arch and eight box. The greater portion of them will have to be lengthened only, the balance entirely rebuilt. It is necessary also, to insure safety to, and to prevent the rapid accumulation of drift and sediment in the canal, thereby forming bars and obstructions to be removed every spring at quite an expense, to construct a new arch culvert at Pratt's farm, station 530, and one at Leland's farm, station 821, and a box culvert just above Wilbur's basin, at station 1,623.

WASTE-WEIRS.

Of these structures there are fourteen, all of which it will be necessary to take up and rebuild with the exception of two; one at Wilbur's basin and the other one mile north. Four-fifths of them are small, cheap structures, and it is proposed to rebuild and enlarge them on a substantial but economical plan, conforming to the enlarged prism.

BRIDGES.

There are, on the old canal, seventy-one road bridges (sixty-six wood and five iron), seventy-six farm, seven change (two iron and five wood) and seven railroad bridges, all of which will require lengthening and raising except eleven road (four iron and seven wood), and three change bridges (two iron and one wood). In a majority of cases it will be necessary to take down and rebuild only one abutment to each bridge. The general plan of farm and road bridges proposed for the enlargement is that of Whipple's wood truss, with wrought iron chords and cast-iron shoes. I am convinced from observation and experience that this style of bridge is about as durable and economical as any other. As decay and failure first begin with the bottom chords at the toe of the braces when of wood, it is obvious that the substitution of iron for wooden chords must add a large percentage to the life of the structure. The general clear span of a right angular bridge is fixed at sixty-four feet.

DAMS.

There are six dams on this canal, one across the Mohawk river, at Cohoes, two across the Hudson river, at Fort Miller bridge and at the

head of the Glen's Falls feeder, and three on Wood creek. The first three are long and important ones, and are being rebuilt; those at Cohoes and Fort Miller bridge of stone, and that at the head of the feeder of wood and stone, all with reference to a depth of seven feet of water on the miter sill at low water. Means have been provided for their completion. Of those on Wood creek, near Whitehall, two are stone and one is of trees, all built some years ago and with reference to enlargement.

As regards the supply of water for this canal when enlarged, there need not be any apprehension. From its junction with the Erie at West Troy to the "three locks" above Waterford, a distance of five miles, the supply will be, as now, from the Mohawk river, at Cohoes; from the "three locks" to Fort Miller bridge it will be from the Hudson river; from Fort Miller bridge to Whitehall it will be from the Hudson river and Wood creek.

* * * * *

In conclusion, I desire to express my appreciation of the efficient services rendered by Messrs. Babcock, Cooper, and their assistants, in preparing the surveys, maps, etc.

Respectfully submitted.

(Signed)

E. H. CROCKER,

Division Engineer.

These accurate surveys, and the carefully prepared maps, plans and estimates of the whole work, show the feasibility and probable cost of the proposed Champlain Canal enlargement. The abstract of the estimates will be found in the appendix of tables.

Its propriety was discussed at some length in my report to the Assembly of 1870, in answer to a resolution on that subject, passed by the House February 26th, 1870, from which I make the following extracts:

The Past and Present Business of the Champlain canal.

Previous to the year 1838 no statistics appear to have been kept of the actual business of this canal.

In order to show the rapid and steady growth of its traffic, it is only necessary to give the total movement for each ten years, beginning with 1838, which appears to have been as follows:

	Tons.
In 1838, total movement	278,586
In 1848, "	326,782
In 1858, "	670,786
In 1868, "	1,163,665

The importance of the traffic of this canal to the State can be comprehended more readily by a comparison of its business with that of the Erie canal.

The total tonnage arriving at tide-water by the Erie and Champlain canals, and the tonnage delivered by each canal, respectively, for the period of ten years last past, is as follows:

Table of tonnage delivered at tide-water.

YEARS.	From Erie canal.	From Champlain canal.	Total at tide-water.
1860.....	2,276,061	568,816	2,854,877
1861.....	2,419,609	580,535	2,980,144
1862.....	2,917,094	485,615	3,402,709
1863.....	2,647,689	627,038	3,274,727
1864.....	2,146,634	658,623	2,805,257
1865.....	2,078,361	651,820	2,730,181
1866.....	2,523,664	751,943	3,305,607
1867.....	2,226,112	803,583	3,029,695
1868.....	2,378,572	862,234	3,240,806
1869.....	2,257,689	838,453	3,096,142
Totals	28,901,485	6,818,660	30,720,145

An analysis of this statement will show that, during the period of ten years, the Champlain canal has delivered twenty-two per cent, and, the period embraced in the last five years, twenty-five and one-half per cent of the aggregate tonnage received at tide-water, the remainder being the joint contribution of the Erie, Oswego and all the lateral canals.

Cost of the Champlain Canal.

The original cost of this canal, exclusive of all charges for improvement and enlargement, is.....	\$1,257,604 26
Amount expended for improvement to and including 1857.....	192,992 81
Amount expended in enlargement and improvement from 1858 to 1869.....	1,245,827 98
Total cost	<u><u>\$2,696,425 05</u></u>

Tolls received from Champlain Canal.

The total amount of tolls collected and credited to Champlain canal from 1826 to 1869, inclusive, is..	\$5,183,239 22
Deduct cost of collection and ordinary repairs for same period.....	3,397,168 48
Net revenue to the State	\$1,786,670 79
Deduct actual first cost	1,257,604 26
Balance to credit of improvement act.....	\$528,466 53

From the foregoing it appears that the Champlain canal has not only paid its original first cost of construction, but has also contributed from its surplus revenues \$528,466.53, toward the work of improvement.

Condition of the Champlain Canal.

The work of improvement has been declared completed, and the contracts closed by law from Cohoes to the Saratoga dam.

From this point to Whitehall portions are still under contract, and several miles of slope-wall are being built or relaid. On all the longer levels the line of the canal is very crooked, and could be vastly improved in many ways by the skill, experience and resources of modern engineering. The Champlain is, for its entire length, very far from being a completed canal. At many points enlargement is easier than completion on the old line, while at many others it should be changed before further sums are expended.

The locks of the Champlain canal, being almost all enlarged, are disproportionate to the prism of the canal.

The boats, too, are all necessarily of the smaller size, and much more water is required to perform the lockages than otherwise; hence a constant strong current is kept up throughout the length of the canal, making the towage more burdensome, as well as subjecting the banks to greater wash and damage, and rendering the canal more difficult and expensive to keep in repair. It needs no argument to prove that an enlarged canal is the first requisite to cheap freight.

Propriety of Enlargement.

The theoretical capacity of a canal may be determined by computing the number of lockages that can be maintained for a given period of time. The present theoretical capacity of the canal is

1,728,000 tons in either direction. Practically the business of a season of navigation cannot be maintained with any such precision or regularity. But assuming even the theoretical capacity of the canal as a just measure of its capability for business, we may demonstrate the propriety, or rather absolute necessity, for its enlargement. Since the period commencing with 1838, it appears that the total tonnage or movement on the Champlain canal has nearly doubled every ten years. Assuming that this rate of increase will continue in the future as it has been maintained in the past, as we are warranted in doing by simply referring to the ore and lumber trade in its present development and prospect, the total movement in 1878 would be 2,327,330 tons. For the last ten years the movement toward tide-water has equaled seventy-five per cent of the aggregate tonnage.

This percentage would make downward movement for 1878 equal to 1,745,498 tons, which, as has been shown, is beyond even the theoretical capacity of the canal. It can, therefore, be safely asserted that the practical working capacity of this canal will have been reached much sooner than the year 1878.

Looking beyond the immediate necessities of business, all must admit that it is the duty of the State, by providing facilities for cheap transportation and an increased volume of trade, to be prepared for the rapid development of the agricultural, manufacturing and mineral resources of northern New York now in progress, and also to intercept and invite into this State its due share of the constantly increasing circuit of the domestic and export trade of Montreal and its commercial tributaries.

It must be remembered that even the business now done upon the canal is not the full or just measure of the present wants and necessities of northern commerce.

The following statistics for 1869, will give some idea of the Canada lumber trade of Lake Champlain :

Total number of feet of lumber imported from Canada and entered in ports on Lake Champlain, within the district of Vermont in the year 1869.....	142,105,531
Total number of feet of lumber imported from Canada and entered into the district of Champlain in the year 1869	108,394,876
Total number of feet of lumber received from Canada and cleared at Whitehall, in 1869	108,094,509
 Total.....	 358,594,916

The receipts of Canada lumber into Lake Champlain, as above, and at Oswego, for the year 1869, were as follows:

Via Lake Champlain.....	358,594,916 feet.
At Oswego	284,539,923 "
Total	<u>643,134,839 "</u>

By chapter 33 of the Laws of 1866, provision was made for a survey of the Hudson river from Troy to Fort Edward, with a view to the improvement of the river for slack-water navigation, and also for a survey of the Champlain canal from Troy to Whitehall, for the purpose of ascertaining the feasibility of enlarging the same to the full size of the Erie (fifty-six feet base, seventy feet water line and seven feet depth of water), with locks 225 feet in length and twenty-five feet in width.

From the survey made in pursuance of this law, which was made for the purpose of estimating the comparative cost of enlargement of the canal as against the river improvement, and directed to some extent by the friends of the river route, the late Hon. J. P. Goodsell, the State Engineer, in his report transmitted to the Senate Feb. 27, 1867 (see volume 2, No. 37, Senate Document for 1867), represents this enlargement of the Champlain canal, for its entire length, as perfectly feasible.

His estimate of the cost of this enlargement to Erie size, with a change of all the locks to 225 feet in length and twenty-five feet in width, made with reference to the high prices of that year, was \$5,800,000.

The best argument that can be now made against this proposed enlargement, is, that before the work can be completed, a ship canal may be necessary from Whitehall to Albany.

This prediction of the early necessity of a ship canal is based upon the changes and developments now taking place in the carrying trade of the northwest and the Canadas. A late paper states the following facts:

"The board of directors of the Chicago board of trade have lately adopted, unanimously, resolutions urging upon the President of the United States what the directors call 'the necessity of opening negotiations with Great Britain, and pressing them to an early conclusion, with a view of securing to the commerce of this country the entire freedom of transit to the ocean via the St. Lawrence river,

and that the Canadian authorities cause the enlargement and improvement of the route to the capacity of our largest vessels.' They desire competition, so as to ensure the cheapest possible transit for the products of the west, on their way to market on the Atlantic coast or in Europe, and the best possible return for the labor and capital thus invested by the western people.

"The whole length of the canals through which a vessel passing from Lake Erie through Canada to the ocean need pass, is only sixty-nine miles. An enlargement of the Welland canal, or the construction of the Niagara Ship canal, would enable the New England States to obtain the whole of their supplies via Canada, and increase the direct shipments from Montreal to Europe.

"Climatic influences, blockading the mouth of the St. Lawrence with ice for half the year, and permitting shipping to enter the harbor of New York at any season, have hitherto, aided by a better geographical position, made the cost of shipping grain to Europe from New York less than from Montreal, and have given a larger amount of freight, in passengers or merchandise on the return trip. The question is one of dollars and cents, and can only be ultimately determined by the individuals who have the freight to send and its proceeds to receive."

Much interest has been excited during the past summer, in New England and Canada, by the proposed Caughnawaga ship canal, of which the Boston Commercial Bulletin speaks as follows:

"Among the most important inland navigation enterprises which have lately been undertaken with a view to cheapen and facilitate transportation between the seaboard and the west, is the Caughnawaga Ship canal, chartered by the Canadian Parliament at its last session. This canal will be between sixty and seventy miles in length, connecting the river St. Lawrence, at a point nearly opposite the mouth of the Ottawa, a little above Montreal, with St. Johns on the Sorel river, which constitutes the outlet of Lake Champlain. The cost of this work, which was thoroughly surveyed many years ago, is estimated four or five million dollars. It will have a capacity for the passage of laden vessels of 800 tons burden; and the plan contemplates the enlargement of the Welland canal and the locks and canals connected with the St. Lawrence above Montreal to the same capacity. When these improvements are all completed, there will be uninterrupted communication for propellers and sailing vessels of that size between Chicago and all the other upper lake ports, and all points on Lake Champlain.

"The effect of opening this new route for inland commerce will be to bring Canada West and the whole upper lake basin much nearer the seaboard markets, and to correspondingly enhance the value of their produce.

"It will also be a great accommodation to the lumber trade of Chicago and Montreal, which is now heavily taxed with railroad charges. The new connections which have lately been formed between the upper lake ports and the heavily timbered regions of northern Minnesota and the Red river territory have largely swelled the volume of this important branch of trade. But our New York friends propose to tap the western trade which is expected to flow through this new channel, and divert a portion of it to their own metropolis, by enlarging canal communication between the Hudson river and Lake Champlain."

STEAM TOWAGE.

One of the most important questions connected with the future success of the canals of this State is that of the cheapest possible system of towing boats.

The present cost of towing boats, by horses, averages about thirty-eight cents per mile, and the average speed attained is a trifle less than two miles per hour.

Economy and the exigencies of competition alike demand a cheaper motive power and increased speed for the movement of boats. Public attention has naturally been directed toward the application of steam power to this purpose, but no system or plan has yet been devised, and put in practical operation, that includes all the elements of success.

While it is strictly the duty of the State merely to provide a good waterway, at the lowest possible rate of tolls, and to leave to private enterprise the task of devising and perfecting the best and most economical methods of moving freights, yet this question of cheap towage is a matter of such great public interest and importance, that liberal inducements should be offered to the inventive genius of the day, to make improvements in that direction. I cordially concur in the recommendation of the Hon. Van R. Richmond, State Engineer and Surveyor, made in his valuable report for this year "that authority be given the Canal Board to employ a competent engineer to prepare designs and plans for the construction, on the most approved plan, of one boat, with machinery complete, to be placed on the canals for

trial at the earliest practicable moment, and that a sufficient appropriation be made for defraying the expenses of the same."

Several experiments in steam towage, made by private enterprise, during the past season may be of interest.

The steam tug, Quickstep, Capt. Howard, left Buffalo with three loaded boats in tow, November 17th, and arrived at Cohoes November 25th, making the actual running time, exclusive of detentions, in six days and ten and one-half hours.

The canal boat, Geo. G. Barnard, capacity 200 tons, propelled by steam, constructed by Messrs. Main & McMilan, at Nyack, Hudson river, made an experimental trip in November last, up the river and through the Erie canal to Schenectady and back, with results which are claimed by Mr. Main, in a letter to the *Scientific American*, as follows:

"The boat is constructed upon the plan of locating an ordinary screw propeller in the center of the bow of the ordinary canal boat, in a cavity or opening (tapering in shape, and terminating about twenty feet from the bow) which is formed for that purpose, with the view of preventing any agitation of the water, of displacing it at the bow, and of replacing it at the stern of the boat. The action of the screw on the trial has been found to draw a current into the opening at the bow, force it along under the bottom, and replace it at the stern, thus allowing the vessel to glide along without making any commotion in the water.

"The results of this trial prove that steam can be applied to ordinary canal boats to propel them three miles an hour, or twice the speed of the present loaded boats, without any injurious action on the canal banks whatever.

"That the speed of the boat is the same on the canal as on the river.

"That the boat can go through a lock in six minutes from the time the bow enters until the stern leaves it, or about one-half the time a loaded horse boat takes; for, owing to the screw being in the bow, when going up the boat can be drawn against the upper gate, against the current, allowing the lower gate to be promptly closed.

"That the boat will pass over the tow-lines of other boats.

"That it can be handled in the locks by three hands.

"That a loaded boat can be run seventy-two miles per day, on one ton of coal, costing \$5, while the towing for horse boats has cost forty cents per mile this season, or \$28.80 for seventy-two miles, and they

take two days to go that distance, and have to pay the crew for two days instead of one.

"That, if desired, this boat will tow one or more loaded boats at a moderate speed. (She towed a boat loaded with 135 tons of cargo, at Rondout, at the rate of two and three-quarter miles an hour.)

"That steam can be applied to any canal boat at a cost of about \$600 for altering the boat, in addition to the cost of the machinery, and then she will be capable of doing twice as much business as before.

"That such a boat can go on the canal, river or lake, with her own steam, and so dispense with all charges for towage.

"That steam can be advantageously applied to a canal boat or barge, with a smaller reduction of the carrying capacity on this plan than on any other, as the boat can be built very full, and yet the water can flow to the screw, and go from it very readily.

"That a boat carrying 200 tons of cargo, on this plan, with a sixteen horse-power engine, and burning one ton of coal in twenty-four hours, will go three miles an hour, while the carrying capacity is only reduced ten tons by the application of the machinery; and if a greater speed is desired it can be obtained by applying more power."

Samuel D. Tillman, LL.D., in a paper read before the American Association for the Advancement of Science, in 1870, makes the following suggestions on improvements in inland navigation:

"The plan of moving several canal boats by one steam tug is objectionable, because the whole moving power is concentrated at one place, and acts upon a very limited quantity of water. The same power divided into four equal amounts, and acting on four times the quantity of water, would be more effective. Such boats are most liable to delays, and are utterly helpless when detached from the steam tug.

"The successful navigation of canals, seems to me, depends on the following conditions:

- "1. Each boat should be automatic, that is to say, self-propelling.
- "2. The build of the boat should be such as to give it the greatest carrying capacity.
- "3. To economize space and power, the boiler and engine should be small, and capable of moving the boat, when loaded, at an average speed of three miles an hour. This rate is about double the present average of loaded boats.

"4. The propelling power should act directly against the water, and not against the bottom or sides of the canal.

"5. If we turn to nature for lessons in propelling, we observe that the slow-moving fish of our fresh water streams have broad tails, bounded by a nearly vertical line; while those remarkable for speed have v-shaped tails, the extremities of which are capable of very quick motion. Applying this principle to slow-moving boats, we infer that a quick motion is not so essential as a large area of propelling surface.

"6. The width of the boat and its draft should only limit the quantity of water against which the propelling surface should act.

"7. The boat should be made more obedient to the helm by enlarging the rudder surface, and arranging them so as to act on shallow water more efficiently than by the common method. The most important of these conditions would be fulfilled by building the boat with four sterns, and placing behind each a propeller; or by giving the boat a scow-shaped stern, and arranging, in one line behind it, four screw propellers, placed nearly as deep in the water as the bottom of the boat, from which would project iron bars for their protection. The locks being eighteen feet wide, the propeller blades could be nearly four feet six inches in diameter, and whether the boat was light or loaded, these propellers would act on the water under the best possible conditions. Behind each of these propellers should be placed a balanced rudder, which, under these conditions, could be made one-fourth lighter than usual; and the tiller of each should be connected by a movable joint, with one bar extending nearly across the boat, behind which the steersman could guide the boat by only exerting strength sufficient to overcome the friction of the apparatus.

"A boat embracing the improvements here suggested has not yet been constructed; but from careful estimate, based on reliable data, I feel warranted in saying that such a boat, when loaded, could be moved at a speed of three miles an hour, with an expenditure not exceeding that now incurred in towing a similarly loaded boat at the rate of two miles an hour by means of horses. The saving thus effected would be between one and two million dollars per annum, on the present business of the canal. A large portion of the carrying trade has been diverted from canals, solely on account of the time consumed in transportation; we may reasonably infer that an acceleration of speed of about fifty per cent would greatly increase the amount of goods transported by these cheap modes of conveyance, and thus correspondingly increase the revenue which the State derives from its canals."

The Hon. E. O. Perrin has published a very able and interesting pamphlet on this subject of steam towage. He advocates the adoption or indorsement of the "Harvey plan," which is stated as follows:

"The plan essentially is, to erect a row of strong posts, nine feet high and twenty feet apart, *on the rear of the tow-path*. On these posts are two continuous compartments, one with a slot opening at the top, and the other directly beneath it, having a like opening in the bottom. Each compartment is made of plank, leaving a clear space inside of one foot square. In this is placed four light iron or steel rails, and a carriage or truck with four wheels is made to fit between them, so that it can travel on them and receive an oblique strain without being displaced. In the center of these trucks is a horn or projection from the shank, hooked in form, which protrudes from the slot above, going one way, and from the slot below going the reverse way in the lower compartment.

"These trucks are placed, say 300 feet apart, and connected together by a strong steel wire rope, of about one inch diameter. These ropes are made endless, half in the box above and half in the box below. They are expected to be made from two to five miles long, single, and, when doubled, to tow along a section of the canal for from one to two and a half miles in length, varying according to loss in friction, caused by curves in the canal or changes of level. Where two of these ropes meet is to be placed two 100-horse power low pressure engines, in one building, and run by one engineer, each engine attached to a driving drum, around which the moving cable and trucks are firmly attached. On motion being given to one engine, the cable or rope attached to it moves on its section of the canal, and will pull anywhere thereon to the extent of the power of the engine or strength of the cable.

"Each of the trucks affords opportunity for attaching the tow-line of a canal boat. The boat is to provide a suitable tow-line, of double the usual length. When ready to start, one of the crew steps ashore, and, placing the bight of his line on a hand spike, waits for a truck to pass, which will occur about once in two minutes. At the proper moment he reaches his line over the horn of the moving truck. If he is bound to Buffalo, for example, he hitches to the upper truck, if to Albany, to the lower one; and, lest the jerk of starting be too great, the deck hand has the doubled end of the rope around a cleat with a half turn, and when the strain comes, pays out the line till the boat is under headway, when the line is made fast. When the captain

desires to stop, all he has to do is to cast off one end of his line, and his boat is disconnected at once, without the trouble of going ashore! At the ends of the cables, by a simple contrivance, the rope is cast off the hook, and a man is stationed in a sentry box to take it up and throw it over the first truck on the next section, while the headway of the boat is not lost. By another simple regulation, no slackening of tow-lines is required on meeting of boats, but both keep on at full speed, without danger of fouling, if well steered."

TOLLS.

The continuance of the present policy of low tolls is another important element in the success and value of the canals to the citizens of this State.

The canals are channels of commerce for the masses, and are indispensable for the cheap supply of food, and for the development of the manufacturing and other industrial resources of the State.

It is estimated that of the 86,000,000 bushels of wheat (in bulk and in flour), received into this State during 1870, that 50,000,000 bushels have been consumed here. This enormous amount will not appear so large when we remember that there are less than 35,000 producers in the State, against 4,335,486 non-producers and consumers. When we add to this the corn and other grains used, far in excess of our production, it is easy to calculate the immense saving to the masses by the reduction of tolls, of a few cents per bushel upon all grain passing over the canals.

No railroad competition can ever take from the canals the greater part of the carrying trade of all products, cheap in value per ton, like grain, coal, ore, iron and lumber. Cheap freight for these products must always inure directly to the benefit of the masses of the people, in the cost of food and the necessaries of life, and foster and protect all the manufacturing interests within the State that give employment to labor, and business to its canals.

The present toll sheet was made late in the spring of 1870, and the new policy had to encounter at once the long organized opposition of the railroads, and many outstanding contracts for freights at low and ruinous prices. The channels of trade had been diverted under the previous policy of high tolls, and it was not to be expected that the advantages of the new system could be at once made available to commerce, and occasion an immediate increase in the volume of tonnage.

Other exceptional circumstances controlled the movement of the products of the west, and accumulated in its storehouses a large amount of freight that must come forward during the season of 1871.

And now that the State can give assurance to the great forwarding interests of the country, of the continuance of good navigation and the consequent regular movement of freight, it is confidently believed that, by maintaining the present rate of tolls, the coming season will show a large increase in the business of the canals, and establish the fact that the beneficial results of low tolls in supplying the wants of the people, can be secured and perpetuated, by a policy which will at the same time keep up the canal revenues to a point that will defray the cost of collection and maintenance and meet all the requirements of the Constitution.

Respectfully submitted.

GEORGE W. CHAPMAN,

ALBANY, January 20, 1871.

Canal Commissioner.

STATEMENT showing the amount of payments made during the fiscal year ending September 30th, 1870, for the different items of new work done, exclusive of engineering expenses on the Eastern Division of the New York State Canals, by contract and by the Commissioner in charge authorized by the Canal Board, and chargeable to extraordinary and ordinary repairs.

EXTRAORDINARY REPAIRS—ERIE CANAL.

Work let by Canal Commissioners under Laws of 1868.

CHARACTER OF WORK.	Amount paid during the fiscal year.	Total am't paid to Sept. 30, 1870.	Estimated amount to be done or paid, including per cent retained.
Rebuilding lock No. 2.....	\$510 00	\$1,224 00	\$29,181 00
Raising and repairing Troy dam.....	5,161 00	18,173 00	3,791 18
Removing slope wall, etc., from lock 2 to Port Schuyler.....	28,678 65	57,884 65	Closed.
Removing slope wall, etc., from lock 20 to a point one mile above upper aqueduct.....	32,690 93	68,700 93	Closed.
Removing slope wall and constructing docking at Rome street, etc., at Rome.....	3,845 08	3,845 08	Closed.
	11,187 86	11,187 86	Closed.
<i>Laws of 1869.</i>			
Iron side walk bridge at Cohoes.....	340 00	340 00	1,061 00
Sluice at Cohoes guard lock.....	.....	.....	1,696 00
Iron road bridge at Oneida street, Cohoes.....	3,898 00	3,898 00	2,262 71
Upper lock upper side cut, West Troy.....	.....	.....	33,260 00
Lower lock upper side cut, West Troy.....	.....	.....	33,685 00
Removing wall bench, etc., from Port Schuyler to lower aqueduct.....	57,562 00	57,562 00	* 54,098 00
Stone dam at sloop lock, Troy.....	.....	.....	57,140 00
Removing wall bench, etc., from lower aqueduct to lock 20.....	7,140 00	7,140 00	16,265 00
Iron road bridge at Spraker's Basin.....	1,620 00	1,620 00	Closed.
Wooden bridge at Ilion.....	4,181 00	4,181 00	2,309 00
Iron foot bridge at Utica.....	1,020 00	1,020 00	1,488 15
Wall bench and vertical wall at Utica.....	9,508 00	9,508 00	8,994 00
Removing wall bench, etc., from lock 43 to 45.....	35,463 00	35,462 00	6,258 00
<i>Laws of 1870.</i>			
Iron bridge, etc., south end lower aqueduct.....	6,749 00	6,749 00	1,452 83
Cast iron bridge, Fonda street, Schenectady.....	.....	.....	2,356 75
Removing wall bench, etc., from Canajoharie to Fort Plain.....	.....	.....	19,830 00
Removing wall bench, etc., from lock 40 to 41.....	.....	.....	21,730 00
Removing wall bench, etc., from lock 41 to 42.....	.....	.....	20,345 00
Lengthening culvert at Frankfort.....	.....	.....	1,174 60
Iron bridge at Ilion.....	.....	.....	4,114 96
Iron bridge at Schuyler street, Utica.....	.....	.....	2,376 00
Removing wall bench, etc., on berme and tow-path sides at Rome.....	.....	.....	5,568 25
Removing wall bench and constructing vertical wall at Utica.....	.....	.....	2,828 00
<i>Work done by Canal Commissioner.</i>			
Waste weir, etc., near Schenectady street, West Troy.....	.....	.....	5,404 86
Lengthening abutment, White street bridge, Cohoes.....	.....	.....	588 48
Removing wall bench, etc., above lock 20.....	21,178 24	21,178 24	2,200 00
Vertical wall across basin at Canajoharie.....	2,300 00	2,300 00	Closed.
Constructing two farm bridges over and ditch adjacent to Rocky Rift feeder.....	.....	.....	1,000 00
Inserting tumble gate, locks 44 and 45.....	9,000 00	9,000 00	Closed.
Removing original bottom at Oriskany.....	651 96	1,667 21	Closed.
Removing wall bench, etc., and constructing 625 lineal feet docking at Rome.....	3,845 08	3,845 08	Closed.

* To December 31, 1870.

ANNUAL REPORT OF THE

Table No. 1—(Continued).

EXTRAORDINARY REPAIRS—CHAMPLAIN CANAL.

Work let by Canal Commissioners.

CHARACTER OF WORK.	Amount paid during the fiscal year.	Total amount paid to Sept. 30, 1870.	Estimated amount to be done, or paid, including per cent retained.
Farm bridge of L. A. Weaver.....	\$635 21	\$697 00	Closed.
Road bridge at Mechanicville.....	642 76	850 00	Closed.
Bridge at McInyre street, Fort Edward.....	1,188 12	3,449 12	Closed.
Farm bridge of G. F. Dudley	231 28	357 00	Closed.
Dredging Whitehall basin.....	15,011 00	17,425 00	\$6,475 00
<i>Laws of 1870.</i>			
Hewitt's lock (excess over old plan).....	17,000 00	.....	.....
Saratoga dam.....	.....	.....	27,000 00
Sluice at Saratoga guard lock.....	7,428 79	7,428 79	Closed.
Improvement at Schuylerville.....	7,068 87	7,068 87	Closed.
Flynn's lock (excess over old plan).....	.....	.....	17,000 00
Improvement, Waterford.....	.....	.....	4,323 00
Glen's Falls feeder guard lock (excess over old plan).....	10,000 00	.....	.....
Vertical wall and stop gate, Fort Edward.....	8,228 00	8,228 00	1,452 00
Wrought iron bridge at Glen's Falls feeder.....	1,181 85	.....	Closed.
Vertical wall at Sandy Hill.....	.....	.....	6,650 00
Dam, head of Glen's Falls feeder.....	.....	.....	32,008 00
Wrought iron bridge at Fort Edward.....	.....	.....	5,010 00
<i>Work done by Canal Commissioner.</i>			
Digging ditch from canal to Wood creek.....	211 20	211 20	Closed.
Docking at Glen's Falls.....	539 37	539 37	Closed.
Vertical wall at Glen's Falls.....	1,385 05	1,385 05	Closed.
Vertical wall foot of two combined locks, Glen's Falls feeder.....	2,163 97	2,163 97	Closed.
Vertical wall above Fort Edward lock.....	3,368 52	3,368 52	Closed.
Vertical wall and removing rock bottom at Sandy Hill.....	3,374 39	3,374 39	Closed.
Vertical wall at Ames Mills, Whitehall.....	314 56	314 56	Closed.
Docking at Fort Ann	2,239 05	2,239 05	Closed.
<i>IMPROVEMENT.</i>			
<i>Work let by Canal Commissioners under chapter 186, Laws of 1864.</i>			
From Saratoga lock to Fort Miller lock.....	816 00	5,389 00	14,847 00
From Fort Miller lock to Moses Kill lock.....	5,542 00	13,600 00	7,795 00
From Moses Kill lock to Fort Edward lock	35,530 00	70,754 00	12,486 00
Section No. 2 Twelve-mile level	23,137 00	41,820 00	6,240 00
Section No. 3 Twelve-mile level.....	31,705 00	46,376 00	6,704 00
<i>Under chapter 715, Laws of 1868.</i>			
Raising and paving towing-path on Wood creek, from lower lock at Fort Ann to the narrows	7,357 40	23,473 40	Closed.
Raising and paving towing-path on Wood creek, from Parish lock to Guard lock.....	17,565 00	48,346 00	Closed.
<i>Under chapter 877, Laws of 1869.</i>			
Section No. 1 Twelve-mile level.....	.....	.....	1,372 00
Whitehall level.....	17,084 00	17,084 00	5,526 00
Raising road bed adjacent to Wood creek.....	9,682 00	14,460 00	Closed.
Improving the narrows on Wood creek	1,380 64	3,794 64	Closed.
Raising and lining tow-path on Whitehall level.....	5,350 20	8,172 20	Closed.

EXTRAORDINARY REPAIRS—BLACK RIVER CANAL.

Work let by Canal Board under Chap. 579, Laws of 1867.

Improvement first level at Rome .....	.....	\$1,683 00	\$2,917 00
<i>Work let by Canal Commissioners, Laws of 1869.</i>			
Bridge at Parker's landing	\$6,698 00	6,698 00	11,322 00
Bridge at Port Leyden	701 50	.....	3,128 00
Iron road bridge at Floyd street, Rome.....	1,615 00	1,615 00	.....

Extraordinary Repairs—Black River Canal—(Continued).

CHARACTER OF WORK.	Amount paid during the fiscal year.	Total amount paid to Sept. 30, 1870.	Estimated amount to be done or paid, including per cent retained.
<i>Laws of 1870.</i>			
Iron bridge at Dominick street, Rome.....	.....	.....	\$2,007 50
Iron bridge at Boonville .....	.....	.....	1,635 50
<i>Work done by Canal Commissioners.</i>			
Cast-iron discharge pipes at Woodhull reservoir.....	\$2,500 00	\$2,500 00	.....

ORDINARY REPAIRS—EASTERN DIVISION—ERIE CANAL.

Stone dam at Cohoes.....	\$34,498 00	\$64,481 00	\$40,000 00
Dredging Albany basin.....	81,421 50	.....	.....
Cast-iron bridge at Schenectady.....	.....	.....	1,100 00
Cast-iron bridge at Utica.....	.....	.....	971 00

CHAMPLAIN CANAL.

Saratoga dam (chargeable to repairs).....	.....	.....	46,754 00
Hewitt's lock (chargeable to repairs).....	16,065 00	.....	7,894 99
Flynn's lock (chargeable to repairs).....	.....	.....	20,495 00
G. F. feeder guard lock (chargeable to repairs).....	17,188 00	.....	6,758 85
Dam head G. F. feeder (chargeable to repairs).....	.....	.....	44,891 00
Wrought iron bridge over G. F. feeder (Cost of old plan chargeable)	450 00	.....	Closed.

BLACK RIVER CANAL.

Work done by Canal Commissioner.

Cast-iron discharge pipes at Woodhull reservoir	282 32	282 32	7,218 00
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[Assem. No. 6.]

ANNUAL REPORT OF THE

ORDINARY REPAIRS

STATEMENT showing the amounts paid to repair contractors, and the amount expended by superintendents and by Commissioner, including salaries and miscellaneous expenditures during the fiscal year ending 30th September, 1870, on the Eastern Division, for ordinary repairs.

STATEMENT showing the classification for each section of ordinary repairs, as made by the superintendents, of "Cost of New Structures" and "Repairs to Old," etc., as required by canal regulations; also, total amount of inventories, for each section, of boats, tools and materials now on hand, belonging to the State.

CANAL AND SECTION.	Cost of new structures.	Repairs to old structures, including salaries, etc.	Inventories.
ERIE.			
Section No. 1.....	\$16,319 29	\$42,478 49	\$15,125 50
Section No. 2.....	8,211 87	67,107 09	9,044 28
Section No. 4.....	4,528 60	44,272 87	9,044 01
Section No. 5.....	10,074 70	52,543 98	5,532 12
CHAMPLAIN.			
Section No. 1.....	11,502 89	84,538 55	20,388 40
Section No. 2.....	21,314 86	48,019 86	11,650 34
Section No. 3.....	14,090 15	22,126 57	10,034 90
BLACK RIVER.			
Section No. 1.....	10,508 98	29,396 55	2,049 81
Section No. 2.....	18,552 98	22,598 40	3,669 00
Section No. 3.....	1,360 10	9,736 84	11,233 50
Total.....	\$116,464 17	\$372,862 65	\$97,821 86

Extraordinary Repairs.—Amount paid during fiscal year.

CANAL.	Section.	Amount.
Erie.....	No. 1	\$119,406 99
Erie.....	No. 2	62,741 66
Erie.....	No. 3	7,475 40
Erie.....	No. 4	50,352 72
Erie.....	No. 5	32,952 35
Champlain	No. 1	39,848 92
Champlain	No. 2	86,636 61
Champlain	No. 3	141,513 91
Black River.....	No. 1	2,400 75
Black River.....	No. 2	19,246 54
Black River.....	No. 3	6,891 13
Total.....	.....	\$569,466 98

Awards of the Canal Board paid during the fiscal year.

CANAL.	Section.	Amount.
Erie.....	No. 2	\$10,832 40
Erie.....	No. 5	700 00
Champlain	No. 2	21,530 37
Black River.....	No. 2	7,500 00
Total.....	.....	\$40,562 77

ANNUAL REPORT OF THE

AWARDS PAID EASTERN DIVISION.

*STATEMENT showing payments on account of awards by the
Canal Appraisers, for land damages, for the fiscal year ending
September 30, 1870.*

DATE.	TO WHOM PAID.	ACCOUNT OF WHAT CANAL.		
		Erie.	Champlain.	Black River.
1870.				
Feb. 14....	R. M. Casler.....	\$413 50	.....	.....
April 7....	Anna Smith.....	534 68	.....	.....
June 16....	Francis E. Spinner.....	550 00	.....	.....
June 16....	A. Shoemaker.....	1,811 00	.....	.....
June 17....	Pattison Freeman.....	1,881 00	.....	.....
June 16....	Enoch Clapp.....	100 00	.....	.....
June 16....	Cornelius V. Defendorf.....	117 60	.....	.....
Barney Eagan.....	75 00	.....	.....	.....
Barney M. Francis.....	141 00	.....	.....	.....
Nathan Graves.....	200 00	.....	.....	.....
Peter Harter.....	100 00	.....	.....	.....
Albert Hitchcock.....	117 50	.....	.....	.....
William P. Kirby.....	117 50	.....	.....	.....
Margaret Morgan.....	150 00	.....	.....	.....
August Otto.....	45 00	.....	.....	.....
Edward Owen.....	64 00	.....	.....	.....
Mary Ann Paine.....	176 25	.....	.....	.....
Archibald Petrie.....	175 00	.....	.....	.....
Harvey N. Presley.....	57 00	.....	.....	.....
Withaus Silver.....	114 00	.....	.....	.....
Margaret Spencer.....	400 00	.....	.....	.....
Henry Snsan.....	235 00	.....	.....	.....
Julius C. Tower.....	180 00	.....	.....	.....
Eunice Wheeler.....	157 00	.....	.....	.....
Jacob Winant.....	100 00	.....	.....	.....
July 5....	P. Buckley.....	.....	\$400 00	.....
July 5....	Rhoda Carey.....	.....	115 00	.....
July 18....	A. Rawson.....	.....	.....	\$2,400 00
July 18....	J. Brierly.....	425 00	.....	.....
July 22....	William Tryon.....	711 65	.....	.....
July 22....	W. A. Evans and E. R. Evans.....	1,356 10	.....	.....
Aug. 1....	James O'Brien.....	.....	700 00	.....
Aug. 2....	John Baer.....	1,673 00	.....	.....
Aug. 2....	William Evans.....	1,964 92	.....	.....
Aug. 11....	S. Cheever.....	.....	1,152 00	.....
Aug. 10....	N. J. Beach.....	.....	.....	100 00
Aug. 16....	Isaac Merritt.....	6,042 00	.....	.....
Aug. 18....	S. E. Burdick.....	540 50	.....	.....
	H. Burdick.....	799 00	.....	.....
	H. Patrick.....	3,701 25	.....	.....
	E. B. Armstrong.....	1,169 13	.....	.....
	James Barse.....	323 13	.....	.....
	A. H. Bissell.....	1,481 15	.....	.....
	T. Casterton.....	1,997 50	.....	.....
	S. A. Covell.....	473 91	.....	.....
	G. W. Covell.....	2,197 25	.....	.....
	P. H. Cleveland.....	499 38	.....	.....
	J. Cleveland.....	748 48	.....	.....
	Rosanna Cooley.....	423 00	.....	.....
	W. Drummond.....	193 88	.....	.....
	Cordelia Gifford.....	1,198 50	.....	.....
	L. S. Haskins.....	2,103 25	.....	.....
	Albert Holmes.....	76 38	.....	.....
	H. F. Joslyn.....	211 56	.....	.....
	Isaac Kent.....	351 33	.....	.....
	W. W. Loomis.....	493 50	.....	.....
	John Launer.....	793 13	.....	.....
	Harlow Morse.....	446 50	.....	.....
	Asa Morrell.....	136 80	.....	.....
	J. H. Nichols.....	272 05	.....	.....
Aug. 13....	Alanson Post.....	2,232 50	.....	.....
	A. P. Palms.....	517 00	.....	.....
	Maria Roberts.....	910 63	.....	.....
	Mary Renshaw.....	227 95	.....	.....
	S. B. Renshaw.....	176 25	.....	.....
	Paul Schneible.....	725 56	.....	.....
	John Sheets.....	963 50	.....	.....
	Carried forward.....	\$46,017 00	\$2,367 00	\$2,500 00

Statement of Awards—(Continued).

DATE.	TO WHOM PAID.	ACCOUNT OF WHAT CANAL.		
		Erie.	Champlain.	Black River.
1870. Aug. 13...	Brought forward	\$46,017 00	\$2,387 00	\$2,500 00
	E. C. Stark.....	705 00	.....	.....
	A. G. Smith.....	1,656 75	.....	.....
	Horace C. Smith.....	675 63	.....	.....
	Abigail Smith.....	1,022 25	.....	.....
	C. S. Tremaine.....	340 75	.....	.....
	Salmon Tuttle.....	2,461 63	.....	.....
	Martin Ullrich.....	1,057 50	.....	.....
	Elias Van Schaick.....	2,282 50	.....	.....
	W. White and E. P. Wait.....	1,735 48	.....	.....
	George A. Wright, Jr.....	1,092 75	.....	.....
	Alexander Wiggins.....	124 84	.....	.....
	O. P. Williams.....	434 75	.....	.....
	George Houck.....	173 31	.....	.....
	Total.....	\$59,730 14	\$2,387 00	\$2,500 00

Total Expenditures of all kinds made on the Eastern Division during the fiscal year.

Ordinary repairs.....	\$1,222,554 47
Extraordinary repairs.....	569,466 98
Awards, Canal Board.....	40,562 77
Awards, Canal Appraisers.....	64,597 14
	<u>\$1,897,181 36</u>

ENLARGEMENT CHAMPLAIN CANAL.

ABSTRACT of character and amount of work required to construct the enlarged canal from the junction of the Erie and Champlain canals, West Troy, to Saratoga Bridge.

QUANTITIES AND ITEMS.	Estimated price.	Amounts.
161 acres of land appropriated.....	\$100 00	\$16,100 00
10 buildings to be removed.....	50 00	500 00
temporary damages.....	.....	5,000 00
grubbing and clearing.....	.....	5,800 00
balling and draining.....	.....	14,500 00
1,113,386 cubic yards excavation of earth.....	25	278,346 50
38,742 cubic yards excavation of solid rock.....	1 50	58,118 00
176,204 cubic yards excavation of loose rock.....	1 00	176,204 00
8,982 cubic yards excavation old masonry.....	1 00	8,882 00
202,541 cubic yards embankment.....	20	40,508 20
138,441 cubic yards lining.....	50	69,220 50
12,000 cubic yards procuring and puddling.....	80	10,400 00
114,684 cubic yards slope-wall.....	2 50	286,688 00
26,890 cubic yards vertical wall, in cement.....	5 00	134,450 00
14,279 cubic yards vertical wall, dry.....	4 00	57,116 00
700 cubic yards loose stone.....	1 50	1,050 00
200 cubic yards loose stone and brush.....	2 50	500 00
12,081 cubic yards masonry, ashlar.....	8 00	96,648 00
200 cubic yards masonry, arch.....	15 00	3,000 00
809 cubic yards coping.....	15 00	12,135 00
340 cubic yards concrete.....	5 00	1,700 00
90,509 feet, B. M., white oak.....	70 00	6,335 63
49,983 feet, B. M., hard wood.....	40 00	1,999 32
468,837 feet, B. M., pine.....	50 00	23,431 85
1,556,229 feet, B. M., hemlock.....	25 00	38,905 75
2,400 lineal feet piles delivered.....	12	288 00
2,400 lineal feet piles driven.....	12	288 00
196,478 pounds wrought iron.....	10	19,647 30
113,494 pounds cast-iron.....	08	9,079 52
10,700 pounds spikes and nails.....	08	856 00
9,576 square yards painting.....	50	4,788 00
142 rods road.....	5 00	710 00
5,685 lineal feet snubbing posts.....	70	3,944 50
Engineering and contingencies.....	.....	\$1,382,182 07
Total.....	10 per ct.	138,213 20
	.....	\$1,520,345 27

ABSTRACT of the character and amount of work required to construct the enlarged Champlain canal from Saratoga bridge to Whitehall.

QUANTITIES AND ITEMS.	Estimated cost.	Amount.
127 acres land appropriated	\$100 00	\$12,700 00
50 buildings to be removed	50 00	2,500 00
temporary damages .....	.....	10,000 00
grubbing and clearing .....	.....	3,000 00
bailing and draining .....	.....	10,000 00
1,188,250 cubic yards excavation earth .....	.25	295,812 50
49,150 cubic yards excavation solid rock	1 50	73,725 00
3,500 cubic yards excavation loose rock	1 00	3,500 00
5,850 cubic yards excavation old masonry	1 00	5,850 00
285,250 cubic yards embankment .....	.20	57,050 00
164,420 cubic yards lining .....	.50	82,210 00
18,000 cubic yards procuring and puddling .....	.80	14,400 00
132,690 cubic yards slope-wall	2 50	331,725 00
8,805 cubic yards vertical wall, in cement	5 00	44,025 00
26,785 cubic yards vertical wall, dry	4 00	107,140 00
700 cubic yards loose stone	1 50	1,050 00
200 cubic yards loose stone and brush	2 50	500 00
10,677 cubic yards masonry, ashlar	8 00	85,416 00
140 cubic yards masonry, arch	15 00	2,100 00
632 cubic yards coping	15 00	9,330 00
270 cubic yards concrete	5 00	1,350 00
88,700 feet, B. M., white oak	70 00	6,209 00
45,200 feet, B. M., hard wood	40 00	1,808 00
454,000 feet, B. M., pine	50 00	22,700 00
8,458,200 feet, B. M., hemlock	25 00	86,455 00
4,800 lineal feet piles delivered	12	576 00
4,800 lineal feet piles driven	12	576 00
172,650 pounds wrought iron	10	17,265 00
100,950 pounds cast-iron .....	.08	8,076 00
8,450 pounds spikes and nails .....	.08	676 00
8,300 square yards painting .....	.50	4,150 00
85 rods of road	5 00	495 00
10,000 lineal feet snubbing posts .....	.70	7,000 00
Engineering and contingencies .....	.....	\$1,209,299 50
Total..	10 per ct.	120,929 95
		\$1,330,299 45

MIDDLE DIVISION.

The Commissioner in charge of the Middle Division respectfully presents his annual report for the fiscal year ending on the 30th of September, 1870.

For a detailed statement of expenditures, and other statistical information forming a part of this report, reference is made to the appendix.

The following is a summary of such detailed expenditures, and shows (1) expenditures for extraordinary repairs, authorized either by special acts of the Legislature or by resolution of the Canal Board ; (2) the amount of expenditures for ordinary repairs, including payments to repair contractors, superintendents of repairs, salaries and expenses of general management ; (3) the amount expended for the reconstruction of locks on the Chenango and Crooked Lake canals ; (4) the expenditures upon the extension of the Chenango canal ; (5) the amount paid for construction work on the Oneida Lake canal ; (6) the total amount paid on awards of the canal appraisers for land damages ; and (7) for expenditures from general fund :

Authorized by Legislature or Canal Board.

Otisco Lake reservoir, Erie.....	\$21,343 00
Improvement of Owasco lake outlet, Erie.....	4,233 00
Raising bank at lock No. 50, Erie.....	680 00
Filling packet boat basin at Syracuse, Erie.....	901 00
Protecting highway, De Ruyter reservoir, Erie.....	2,278 00
Rebuilding bridges on change of plan, Erie.....	26,276 77
Removing wall benches, Jordan level, Erie.....	34,731 00
Removing wall benches, Syracuse and long levels, Erie.	25,143 00
Culvert near Burdick's bridge, Erie.....	2,567 00
Swing bridge at Higginsville, Erie.....	2,924 00
Ditch on berme bank at Canastota, Erie.....	500 00
Bottoming down long level, Erie.....	34,340 62
Repairing stone dam at Skaneateles, Erie.....	12,935 49
Protecting banks with brush and stone, Erie	9,286 90
Cowasselon aqueduct, Erie.....	19,300 00
Minetto dam, Oswego.....	10,761 00
High dam, Oswego.....	4,216 00

Raising berme bank, Oswego.....	\$29,204 44
Bulkhead at Farwell's mill, Oswego.....	2,006 00
Vertical wall on enlargement section No. 4, Oswego....	3,213 00
Raising banks.....	4,573 00
Rebuilding docks on side cuts at Salina, Oswego.....	7,990 00
Rebuilding bridges on change of plan, Oswego.....	17,096 61
Rebuilding three locks, Chenango.....	38,709 00
Swing bridge at Norwich, Chenango.....	2,499 53
Rebuilding aqueduct at New Hartford, Chenango.....	33,989 15
Constructing pier at Geneva, Cayuga and Seneca.....	12,654 15
Rebuilding four locks, Cayuga and Seneca.....	25,315 00
Excavating original material near Brickyard Point, Cayuga and Seneca.....	4,543 28
Iron bridge at Seneca Falls, Cayuga and Seneca	4,980 00
Protecting berme bank along Seneca lake, Cayuga and Seneca.....	7,028 39
Vertical wall at Seneca Falls, Cayuga and Seneca.....	1,787 17
Swing bridge at Cayuga, Cayuga and Seneca.....	680 00
Rebuilding bridges on change of plan,Cayuga and Seneca	5,401 99
Dredging between lock No. 1 and Seneca lake, Chemung	3,315 00
Cleaning and deepening State ditch at Horseheads, Chemung	2,992 00
Repairs of break in dam at Corning, Chemung.....	60,000 00
Total.....	\$480,394 49
For ordinary repairs, including payments to repair contractors, superintendents of repairs, incidental ex- penses, salaries, and expenses of general management.	285,873 15
Construction of the Oneida Lake canal	156,086 00
Extension of the Chenango canal.....	335,935 83
Payments of awards of canal appraisers.....	351,187 44
From the general fund	250 00
Engineering, exclusive of Chenango extension, and Oneida Lake canal.....	6,579 39
Total.....	\$1,616,306 30

ERIE CANAL.

REPAIR SECTION No. 7.

This section extends from Higginsville to the Limestone Creek feeder, twenty-seven miles, and embraces the Oneida, Cowasselon and Chittenango Creek feeders, and Erieville and Cazenovia Lake reservoirs. The changing of the Cowasselon culvert into an aqueduct was done and brought into use at the opening, and will afford great relief to the creek in high water, though, to get the full benefit of the change, the channel below should be lowered for a considerable dis-

tance. The Chittenango creek channel below the aqueduct has also been straightened, widened and deepened. A swing-bridge at Higginsville has been constructed, iron needle beams put into a bridge, and a ditch on the berme at Canastota cleaned out; more brush and stone have been put on the rear of the banks in various places, and more must be put on another year to effectually secure them.

The superintendent of repairs gave this section a pretty thorough bottoming-out on the tow-path side last spring, placing the most of the material directly on the tow-path, which has done considerable toward raising the low banks. The berme side has a much larger deposit to be taken out from time to time, and may eventually bring the tow-path to its original height by continually placing it there. There are places in the bottom that were never dug down to the proper level; one in particular, over a mile in length, commencing at Chittenango and extending east. There has been no delay to the navigation (although the water in the reservoirs got very low, one entirely emptied), which was due to the watchfulness and efficiency of the officers having the matter directly in charge. It is believed by the commissioner in charge that much of the bottoming on this and other sections of the canal can be done cheaper with a dredge, to be run during the summer, when the days are longer and labor cheaper, than in any other way.

REPAIR SECTION No. 8

Extends from the Limestone feeder west to Lock 50, embracing the rest of the long level, six miles, and five miles west therefrom—a total of eleven, together with the Limestone and Butternut Creek feeders, and the De Ruyter reservoir. The long level, for the most part, between Lodi and Limestone, was bottomed down last winter, on the plan of reducing it eighteen inches at Lodi and running out at Limestone. It has had a very marked effect upon the navigation, and should be fully completed. The removing of wall benches on the long and Syracuse levels, and substituting slope and vertical walls, have also had their proper effect in improving the canal. These works should be fully completed also. The culvert near Burdick's bridge was taken up, lowered and rebuilt last spring, and the land owners in that vicinity are now reaping the full benefit of the change. Much has been done to repair the highway and secure it from the wash of the discharge from the De Ruyter reservoir; the bank raised near Lock 50, and the packet basin at Syracuse filled.

Warren and Lock street bridges have been rebuilt of iron, and iron needle beams inserted in William, McBride and Clinton street bridges, Syracuse, and Basin street bridge, Geddes. There has been no delay in the navigation from any cause, which may be attributed to the same watchfulness and care by the canal officials, as in other cases. The levels were well bottomed out, and the structures put in good order before the opening.

REPAIR SECTION No. 9.

This section extends from the foot of lock 50 to the east bounds of Wayne county, thirty-four miles, and includes the Otisco Lake reservoir and Camillus feeder, the Skaneateles Lake reservoir and feeder, and the Owasco feeder. Although the season has been very dry, water has been abundant and navigation good. With the Otisco and Skaneateles reservoirs no apprehension of delays need be felt on the Jordan level for the want of water. With the removal of the wall benches now in progress, and the building of slope and vertical walls from the bottom up, together with a thorough bottoming out, this level may yet become perfect; a result certainly most desirable to attain, as it has heretofore been impossible to keep up good navigation for want of these improvements. The appropriation for the removal of the wall benches is now limited, but it should be increased sufficiently to keep the work all the while moving forward.

The Port Byron level, over and above the lockage water from the Jordan level, is supplied by the Owasco creek, through a narrow feeder built along the side hill, formerly a mill-race. It is a source of expense all the time to keep in working order, from its very imperfect construction originally. For about a thousand feet nearest the canal, the water is carried in a wooden trunk, part of it high, supported on bents, and troublesome to keep in position. The Owasco Lake improvement is now completed, and renders the water of that lake available to a point three feet below the ordinary stage during the season. It is liable to be wholly emptied as a reservoir in any year of low water, as was its condition last year, and the canal left but partially supplied from that source; in which case, the Port Byron level must be supplied by drawing through the canal from the Jordan level. More water can be obtained from the Owasco lake, however, by raising the dam at the foot, and converting it into a reservoir, by thus raising the surface. I have ordered a survey and estimate to be made of the cost of raising the dam to

such a height as will retain and hold the water of the lake at a point two and a half feet higher than at present; and separately to ascertain the amount of damages done to the lands along the shore. My conviction is, that the mill owners on the stream below the dam, who will be benefitted to a large extent, should share in and pay a part of the land damages. Iron needle beanis have been put into the Brutus street bridge at Weedsport, Crane brook bridge, and into Dougherty street bridge at Port Byron.

Quite a large amount of bottoming out was done by the superintendent last spring, principally along the tow-path side, and the material as in other cases placed on top, serving to raise the bank. There are large quantities more to be taken out from time to time; most of the lock-gates were put in new, and the other mechanical structures well repaired. The re-wooding of the aqueducts generally must soon be attended to. For this purpose the superintendent has made a contract for a limited supply of timber to be used next spring.

OSWEGO CANAL.

REPAIR SECTION No. 1.

This section extends from Syracuse to Three River Point, fifteen miles, and includes the Seneca river towing-path, six miles; total twenty-one miles. Excepting the delay of inserting two new ready framed gates at lock 2, Salina, and a few hours' detention on account of a break in one of the salt slips, navigation has been continuous. The salt slips were largely bottomed out, and all of the structures put in complete repair before the opening. The repair of the docks of the salt slips, embracing their re-erection on piles in some cases, and in some cases raising them, is done by contract. Much was done last winter, and more will be done this year. They are continually out of order, caused more or less by the numerous erections of salt blocks, brine vats and piles of coal so close upon the edges of the slips. The slips are already narrow, and any little yielding of the banks narrows them too much. The banks below Mudlock, although not raised, will doubtless be above any high water likely to occur. The culvert at Salina and ditch leading across to the lake are being constructed, and will be ready for the opening another spring. The canal span of the river bridge at Cold Spring, has been built of iron in conjunction with the two other spans, by the towns of Clay and Lysander, and the whole is a beautiful and complete structure. Some

vertical wall has been built on section 4, and more is contemplated. Iron bridges have been put up at Division street, and iron needle beams into James street bridge, Syracuse, and Park and Salina street bridges, Geddes.

REPAIR SECTION No. 2

Embraces the Oswego canal from Three River Point to Oswego, twenty-three miles, the Oneida river improvement, twenty miles; total forty-three miles. There has been no delay to navigation except for a few hours at a time from sunken boats or small repairs to lock-gates. Bottoming out was done at such points as were out of water before the opening, and soon after dredging was required at the foot of the new locks generally, and at some other places, by the sliding down of the hills into the canal. The Minetto dam has now been worked at the third season, and yet there remains a part of the apron and the extension of the shore abutments to complete it. The middle section put in this summer has been very difficult and expensive. Having built the two ends first, the high water and ice running through the middle section, cut down the foundation, although rock, from four to six feet extra depth, and carried away seventy feet of the mid-river end, built in from the east shore, and scattered the material down stream. The work, therefore, had to be surrounded with a coffer dam, gathered up from among the debris. The High dam was found to be so leaky that at one time all the water of the Oswego river went through it, none went over, and navigation for the time being was partially lost. Graveling was commenced, and as the work went on certain other bad indications made their appearance. It was decided to commence the work of rebuilding at once, and the contractors were ordered on. A cribwork coffer-dam was thrown across the boatway to the mill, so that in case of any accident to the mill (old and out of use), navigation should not be lost. At the opposite or canal end of the dam, cribwork for about 100 feet was sunk on the bed of the river below the apron to secure the wooden abutment (placed there at the time of the "big break" in 1865), which was becoming undermined, and likely to be upset and lost, and the canal swept away below. The west half of the apron proper of the dam, or that portion beyond the break of 1865, was found to be so much undermined that the most of it had to be taken up and rebuilt. One permanent crib, going to form a part of the new dam, was put in at the extreme west end, and on it mounted

a temporary wooden abutment to be taken off another year, and replaced by the stone one according to the adopted plan. The expenditure has been nearly \$20,000, but only a small part of it is applicable to the future new dam. There should be no failure to appropriate money to prosecute this work another year, as nothing will be very reliable here, until the whole dam is rebuilt. The berme bank account has been closed, the bulk-head at Farwell's mill at Fulton rebuilt, and iron needle beams put into the new bridge on First street, Fulton.

CHENANGO CANAL.

REPAIR SECTION No. 1.

This section extends from Utica to the foot of lock 81, one mile south of Hamilton; thirty-one miles. The aqueduct at New Hartford, so badly damaged by the flood of the 8th of July, 1869, has been rebuilt, and an additional span added, giving it twenty-five per cent. more capacity to discharge a flood than it had before. Locks 18, 19 and 22 have been changed from the composite plan to solid stone walls in cement.

In the absence of any appropriation or legislative direction, the undersigned has felt a certain degree of embarrassment in determining upon the course to pursue in relation to the threatened failure of so many of the old locks. Former reports have all called attention to them, and yet nothing has been done to authorize the work or to pay for it, except as an ordinary repair. Should one utterly fail at any time during the navigable season, the canal would be closed for a considerable time. However, so long as he was charged with the responsibility of maintaining and keeping up the navigation, he determined upon the partial reconstruction of four of the poorest, to wit, locks 17, 27, 47 and 51. The work is to be done under the direction of the superintendent of repairs upon this section, and preparation is now being made to perform the work this winter.

REPAIR SECTION No. 2.

This section extends from the foot of lock 81 to and including the first farm bridge above lock 100 thirty-four miles. A swing bridge has been constructed at Norwich, and the feeder banks raised at Oxford. There was a delay of three days mending a break below lock 83 on the 19th of August, and from sunken boats; and from putting in a new lock gate at No. 96, three

days more, making a total of six days. Locks 84, 85 and 91 need rebuilding very much indeed, as also the aqueduct across Baird creek, below Oxford, and across the Canassawacta at Norwich. A new bridge is required at Earlville, and both the tow-path and berme banks should be raised for a short distance below.

What has been said in general terms of the condition of the structures on repair section 1 will apply with equal force on this section.

REPAIR SECTION No. 3.

This section extends from the first bridge north of lock 100, through to the city of Binghamton, a distance of thirty-two miles. There have been in existence for many years lock contracts for locks 105, 106, and 107 on this section. These were by no means the poorest locks. The report of last year declared 101, 107, and 110 to be the poorest. Arrangements are being perfected with the contractors, whereby 101, 107, 108, and 110 will be rebuilt this winter. As to the remaining locks on this section, they are generally in a better state of repair than upon the other parts of this canal. There is a culvert near lock 101 which so far failed, that most of the water finds its way under the floor, but changes before getting through, running out behind the wings at the foot. This is to be overhauled this winter. An aqueduct between Chenango Forks and Port Crane is failing in one of the piers, it having broken in two and settled down badly at the ends. The tow-path near the crossing of the Binghamton railroad, so often flooded and damaged by high water, has been raised.

CAYUGA AND SENECA CANAL.

This canal extends from the Erie at Montezuma to Seneca Lake at Geneva, with a branch from lock 9 to Cayuga; twenty-three miles. The pier at Geneva is completed, and a lighthouse placed on the outer end, and altogether is a good improvement to the harbor. The berme bank of the canal running down the shore of the lake, which had become damaged by the winds and waves, has been protected to considerable extent by rip-rap, but more should be done to effectually secure it; estimated at from \$8,000 to \$10,000. Locks 2, 3, 9 and 11 were rebuilt during the winter and spring. Lock 3 at Seneca Falls, completed just at the opening, threatened to give some difficulty, on account of a failure of the cement to set properly. The mortar washed out some, and the walls yielded to the pressure of the

earth outside, which was increased by the water settling through the walls and saturating it. The lock fortunately was extra wide, and no particular trouble grew out of it. Lock 11 was delayed till the 23d of June before it was ready for use; at the opening it had not been begun, the high water flooding everything in the vicinity of it. It was not on the same canal, but on the outlet of Cayuga Lake; and the water being high, boats were towed through the river, entering the canal below. An iron bridge has been built at Ovid street, Seneca Falls, and another at Canal street, Waterloo, and iron needle beams put into Canal street bridge, Geneva, and Virginia street bridge, Waterloo. A swing bridge has also been built near lock 11, at Cayuga. Some vertical wall has been built at Seneca Falls, and more is to be put in this winter. The stop law of 1862 arrested the section work between Cayuga and the free bridge, before it was brought down to the bottom; the want of it gives some trouble in low water and it should be taken out.

CAYUGA INLET.

By an act of the Legislature of 1869, an appropriation of \$15,000 was made, to be expended under the supervision of the Canal Commissioner, in constructing a tow-path, dredging the inlet, confining Fall creek to its proper channel, repairing the old, and constructing a new pier to prevent the accumulation of bars, and to regulate the passage of the water at the mouth of the inlet. There was paid out in 1869 the sum of \$3,653.52 on the tow-path on the west side, and toward confining the water of the creek. The remaining work was contracted for in 1869. There is now built about 300 feet of the new pier, the old partially repaired, and the balance used in dredging out the inlet. To complete the work as contemplated by the law of 1869 will require a further appropriation of at least \$15,000. The expenditures of the present appropriation, under the present contract, will soon be made, and the account closed.

CHEMUNG CANAL.

This canal extends from the head of Seneca lake to Elmira, including the feeder from Horseheads to Knoxville thirty-nine miles. Soon after the close of the fiscal year of 1869, the contract for dredging the canal between the lake and lock was entered into, and the work has been going on this season. The cleaning out of the State ditch, across the lands of Mr. Sayres and others, has been done, and

the account closed. A contract for raising and extending the break-water at Watkins has been made, and another for taking up an old lock and constructing a culvert at Elmira, and both will soon be commenced. The dam at Gibson, reported upon last year as being in a dangerous condition, and for which \$60,000 was asked to be appropriated to secure it, went out in a flood, on the 19th of April, for 250 feet in length, on the east end; also the chute, a structure built and maintained by the State, used for conducting rafts of timber over the dam; also the crib-work docking, forming the shore side of the chute, 500 feet in length, together with about 200 feet of crib-work proper, faced on both sides, above the guard lock, forming the canal on one side, and the abutment of the dam on the other; also, about 300 feet of shore docking above the guard lock. The waste-weir below, and a large quantity of embankment, were also carried out. Besides the breach in the dam, there was 130 feet in length of apron on the portion left in, raised so that it had to be taken up, piles driven, and relaid. The same flood carried away 400 feet in length of the high docking and embankment near Corning, undermined and let down to a certain extent 400 feet more, which was secured by driving piles in front, and tieing them back across the top of the banks with heavy iron rods to corresponding short piles driven in the rear. Navigation was lost; and the only plan on which it could be restored, as well as to rebuild the damaged works, was to put in a coffer-dam. The water was deep and the current rapid. A coffer-dam was built, however, 400 feet in length, by driving rows of piles, locking them together with timber, sheeting and covering the whole with plank, and filling in with brush, stone and earth.

In the meantime the waste-weir was rebuilt below, and the crib-work and docking above and the docks near Corning rebuilt and repaired. This work was done, the water raised, and a few boats got off, when on the 11th of June there came another flood, carrying away about 200 feet of the coffer dam, and damaged the remaining 200 feet, and dug down the bed of the river from twelve to fifteen feet deeper than before. The dam was replaced on substantially the old plan, except that more piles were driven, and an apron added, supported on piles for better security in case of still another flood. This was again completed, and navigation fully restored on the 21st of July, and there has been no delay since. During this time material has been delivered for rebuilding the main dam, but no work done. This was now to be done, 250 feet in length, together with the

130 feet of damaged apron to be taken up and additional piles driven and relaid, and several hundred feet of old chute taken up below the dam, cribwork docking to be erected in its place and banked in, together with a stretch of several hundred feet in length of feeder-bank to be restored and protected with brush, stone and gravel below. It was now getting late in the season for so much work to be done and escape the fall floods. Large forces of men and teams had to be employed, and the work pushed forward with vigor to escape disaster sure to come on the recurrence of a flood. The main dam is supported on eight rows of piles driven from twenty to forty feet deep, tied with heavy oak timber, sheet-piled and filled in with stone, brush, gravel and earth. The apron is all supported on piles and filled in, in the same manner. Lastly, it is all planked over and thoroughly secured with iron straps and bolts. The cribwork and docking are also supported on piles. This flood likewise carried away the towing-path and dyke, extending from Gibson to a point opposite Corning, together with the towing-path bridge across an arm of the river, which has been maintained by the State at great expense since the construction of this canal. To reconstruct it properly would have cost a large sum, probably not less than \$25,000 to \$30,000, with many chances from its exposed situation that it would be destroyed again, possibly within another year. In this dilemma the commissioner purchased a small steam tug suitable for such service, and has performed all the towing from Gibson to Corning without any compensation. The cost of the tug with an extra wheel was \$4,600, at Philadelphia, and it has cost for the season, commencing in July, \$1,850 for operating and keeping it in repair. The dam, although repaired under the advice and skill of engineers, as to the plan and manner of doing the work, may not now be such a structure as should be perpetuated without some change in it. The river is from 1,200 to 1,500 feet wide, and is intercepted by the dam for about 600 feet, and for the balance by a high embankment. With the clearing up of the country, and the consequent suddenness of floods, and their greater rise, it is a question perhaps of very little doubt about the policy of lengthening the spill-way of the present dam. It is also urged by old residents long acquainted with the Chemung river, and from their knowledge of the increase of the height of the water over former years, that the spill-way should have been lengthened now. There was a break in the embankment forming the extension in 1865, which was equally as expensive, including land and other damages, to repair. The under-

signed did not feel authorized in repairing the break, in the absence of an appropriation or legislative direction, to make any expenditure to lengthen the spillway. It is estimated to cost to lengthen it some 200 feet, \$60,000.

CROOKED LAKE CANAL

Extends from Dresden on Seneca lake to Penn Yan, and connects with the Crooked lake there; length, eight miles. The superintendent of repairs for this canal, by direction of the Canal Commissioner, is contracting for the delivery of materials preparatory to rebuilding locks 8, 9, 10 and 11, to which the report of last year called attention, together with locks 18 and 19, and is to enter upon them at once after the close of navigation. What has been said in relation to the locks upon repair section No. 1 of the Chenango canal applies directly to the locks of the Crooked Lake canal; and these locks are being rebuilt under precisely the same circumstances, and for the same reasons there given. The canal level below Penn Yan, about one mile and a-half in length, and for which an appropriation of \$2,000 was made last winter, will be put under contract to be completed ready for the opening next spring.

ONEIDA LAKE CANAL.

The appropriation for this canal by act chapter 934, Laws of 1867, has become exhausted and the work stopped.

The amount appropriated was \$346,153.47, and the work was to be let conditioned that it should not exceed this sum. The engineer's estimate was \$306,000, and the letting of it amounted to \$258,000. The work was divided into five sections, and each let for a gross sum including the locks and all other structures. The work commenced; but the contractors soon claimed that the excavation was a harder material than anticipated, and that in some cases the quantities would be increased. A relief bill was passed by the Legislature (chapter 913, Laws of 1869), authorizing the Canal Board to make a supplementary contract for removing this material, but which should not, in any event, exceed the appropriation. This was done, increasing the cost of the work to \$314,000. Subsequently, and by act, chapter 737 Laws of 1870, the Legislature authorized the Board of Canal Commissioners to examine the contracts for building the locks and take proof, and if found that the prices were fixed by the officers of

the State, and were insufficient to pay the actual cost, that they should allow such prices instead as would pay the same. Accordingly action was taken, and it was found by the board that the prices for lock work were below the actual cost. Estimates were made in detail, which resulted in increasing the total cost of the canal to \$416,000, or in excess of the original appropriation \$69,846.53. To this should be added for work done and not paid for and engineering and contingencies, \$30,153.47; making a total of \$100,000 to be appropriated to complete this canal.

If this appropriation be not made, and the canal not finished, there will be a direct loss on materials delivered, and a general depreciation on the work in progress.

CHENANGO CANAL EXTENSION.

The Legislature of 1870 made an appropriation of \$200,000 toward completing this work. The moneys already earned under the contracts, together with the allowances made by the Canal Board under special laws relating to some of the contracts, absorbed the appropriation early in the summer, leaving barely sufficient to secure the materials procured and delivered, and to pay for engineering.

Especial pains have been taken upon the whole line to secure the large quantity of lumber on hand against loss or injury; but if the completion of the work is not provided for during the present session, it will probably be better to dispose of all the destructible materials on hand for the best prices which can be obtained.

The cost of completing the extension to Owego is estimated at \$355,631.12; and the entire cost of the work to the Pennsylvania line, according to the original plan, at \$978,794.12. It is much easier to estimate this accurately in advance than when it was commenced, and it is believed that no more money will be required to finish the work and put this canal in operation.

In determining what policy to adopt, this important fact should be kept in view: All the awards for land and other damages have been made with reference to a *completed canal*; and if it is abandoned in its present condition, these awards must be revised and adjusted with reference to permitting it to remain permanently as it now is.

What this policy will cost the State must be, to a great extent, conjectural; but it is safe to assume that it will be a formidable sum, and that it will be a most prolific source of claims, the prosecution of which will extend through many years.

The following statement will show the present condition of the work :

Amount of work under contract.....	\$1,971,546 08
Work under contract.....	243,773 00
Total cost.....	\$2,215,319 08
Amount done Sept. 30, 1870.....	1,377,574 69
Amount remaining.....	\$837,744 39

DRAINING CAYUGA MARSHES.

Paragraph two of act chapter 492, Laws of 1870, is in the following words: "The following amounts are hereby appropriated for the several objects specified, namely: For removing obstructions from the Cayuga outlet and Seneca river, thirty thousand dollars, appropriated by chapter three hundred and four, laws of eighteen hundred and sixty-eight, which sum is hereby re-appropriated, and shall be expended in pursuance, and as provided in said chapter, and for no other purpose whatever."

Chapter 304, Laws of 1868, is in the following words: "The sum hereby appropriated shall be paid out of any funds appropriated or to be appropriated for extraordinary repairs on the middle division." And further, "said sum, or so much thereof as shall be necessary, shall be applied under the direction of the canal commissioner in charge, to the purposes specified in chapter one hundred and seventy-nine of the laws of eighteen hundred and fifty-eight, as amended by chapter four hundred and sixty-five of the laws of eighteen hundred and sixty-two, and to no other purpose whatever." And further: "No part of the said sum shall be expended except upon a contract that will insure the entire completion of the work."

There has been nothing done under the law of last winter, or under its reference to other laws, for the reason that there is no money appropriated, in general terms, for extraordinary repairs ; all is specific, as may be seen by reference to the law, act chapter 767 Laws of 1870. Hence nothing has been done. Should the Legislature amend the law and make a specific appropriation of the thirty thousand dollars, it would be a matter of serious doubt whether a contract could be made with any party to do the work for that sum. The estimate of thirty thousand dollars is an old one, made before war prices ruled, as they now do.

STATEMENT giving description of sections and expenditures thereon during the fiscal year.

ERIE CANAL.

The Middle Division of the Erie canal extends from the eastern bank of the Oneida Lake canal to the east line of Wayne county, seventy-two miles, and comprises three repair sections, as follows:

REPAIR SECTION No. 7.

E. T. FREDERICKS, Superintendent. Contract surrendered April 1, 1870, under act chapter 55, Laws of 1870.

This section embraces twenty-seven miles of the Erie canal, extending from the east bank of Oneida Lake canal to the Limestone creek feeder; the Oneida creek feeder, two miles in length, navigable from Durhamville to Oneida, a distance of one mile; and the Erieville and Cazenovia Lake reservoirs and Chittenango feeder. Total, twenty-nine miles. The structures are: two aqueducts; twenty-three culverts; one wooden lift lock (Oneida feeder); five iron bridges; three wooden farm bridges; fifteen wooden road bridges; one guard gate (Oneida feeder); three waste-weirs; three feeder dams; two guard gates.

This section was under contract for annual repairs with Clark Snook, as assignee of William Austin, until April 1st, 1870, when the contractor petitioned the Canal Board for the abrogation of the same, which was granted; since that time the repairs and management of the section have been under the immediate control of the superintendent in charge.

The expenditures upon this section during the last fiscal year were as follows:

ORDINARY REPAIRS.

By the late Canal Commissioner (total payments for all purposes)	\$9,627 34
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By the present Canal Commissioner:

For compensation of repair contractor..	\$3,520 78
Miscellaneous expenditures.....	5,776 67
Commissioner's salary, in part.....	500 00
	9,797 45

By superintendent of repairs:

For repairing bridges.....	\$2,425 90
For bottoming out canal.....	7,201 34
For raising and repairing banks.....	1,250 94
For clearing out creeks and feeders, re-pairing aqueducts and waste-weirs....	2,519 82
For new State scow.....	1,600 00
For salaries and miscellaneous.....	6,318 49
	—————
	\$21,316 49
	—————
	\$40,741 28

EXTRAORDINARY REPAIRS.

Brush and stone protection of banks....	\$2,872 90
Changing Cowasselon culvert into an aqueduct	19,300 00
Swing bridge over old Oneida Lake canal at Higginsville.....	2,924 00
Ditch on berme bank near Canastota.....	500 00
	—————
	25,596 90
Deposit to secure annual contract refunded, with accrued interest.....	5,017 24
	—————
	\$71,355 42
	—————

REPAIR SECTION No. 8.

ABRAM SCOUTEN, *Superintendent*. **AARON G. FISH**, *Repair Contractor*. Contract expires January 1, 1874.

This section extends from Limestone Creek feeder to Lock 50, above Geddes, including Limestone and Butternut feeders, each navigable one mile; total, thirteen miles. The structures are: Three double stone lift locks; two aqueducts; four culverts; one weigh lock; one wooden farm bridge; three wooden feeder bridges; one wooden towing-path bridge; nine wooden road bridges; two iron tow-path bridges; nine iron road bridges; one iron foot bridge; one feeder dam, one waste-weir; three lock houses; one State shop.

The expenditures upon this section during the fiscal year were as follows:

ORDINARY REPAIRS.

By the late Canal Commissioner (total payments for all purposes)	\$16,623 38
 By the present Canal Commissioner:	
For compensation of repair contractor..	\$13,486 41
Miscellaneous expenditures.....	5,776 67
Commissioner's salary in part.....	500 00
	19,763 08
By Superintendents of repairs.....	769 50

	\$37,155 96

EXTRAORDINARY REPAIRS.

Strengthening banks near Lock No. 50..	\$221 00
Removing wall benches	25,143 00
Rebuilding bridges on change of plan...	12,461 00
Filling packet basin at Syracuse.....	901 00
Bottoming down Long level.....	34,340 62
Rebuilding culvert near Burdick's bridge	2,567 00
Protecting highway at De Ruyter reservoir	2,278 00
Award by Canal Board to O. P. Root..	1,942 00
Engineering expenditures.....	5,000 00

	84,853 62

	\$122,009 58

REPAIR SECTION No. 9.

WILLIAM JONES, *Superintendent*. Contract surrendered April 10, 1870, under act chapter 55, Laws of 1870.

This section extends from the foot of lock 50 to the east line of Wayne county, embracing the Skaneateles lake and feeder, Otisco Lake and Camillus feeder, navigable one mile; total, thirty-five miles.

The structures are: Three double stone lift locks; six aqueducts; two waste-weirs; six culverts; one wooden change bridge; eleven wooden road bridges; six wooden farm bridges; eleven iron road bridges; one iron foot bridge; two guard gates; four feeder dams; three receivers.

This section was under contract for annual repairs with S. D. Keller, assignee of Scovil, Eaton and Mowry, assignees of Amos W. Chase, until April 10th, 1870; when the Canal Board was petitioned in due form for the abrogation of said contracts, which was granted. Since that period the repairs and general management of the section have been conducted by the superintendent in charge.

The expenditures and payments for all purposes on account of this section during the past fiscal year were as follows:

ORDINARY REPAIRS.

By the late Canal Commissioner (total payments for all purposes).....	\$22,659 91
By the present Canal Commissioner:	
For compensation of repair contractor..	\$2,990 00
Miscellaneous expenditures.....	5,776 67
Commissioner's salary in part.....	500 00
	9,266 67
By superintendent of repairs, viz.: bottoming down section and deepening Owasco outlet.....	\$8,063 84
Repairs to locks, and building 24 new lock gates	3,818 63
Raising tow-path and back ditching.....	3,745 86
Repairing bridges.....	1,099 75
Building work-shop.....	1,432 36
Repairing feeder dams.....	888 50
Repairing docking and relaying slope walls	551 00
Repairing aqueducts and waste-weirs...	422 00
Salaries and miscellaneous.....	5,532 54
	25,554 48
	\$57,481 06

EXTRAORDINARY REPAIRS.

Constructing Otisco Lake reservoir.....	\$18,023 00
Improvement of Owasco outlet.....	1,768 00
Removing wall benches.....	34,731 00
Engineering expenditures.....	400 00
Deposit to secure annual contract refunded with accrued interest.....	4,994 00
	59,916 00
Total on section.....	\$117,397 00

OSWEGO CANAL.

This canal extends from Syracuse to Oswego, thirty-eight miles; and includes the Seneca river towing-path and Baldwinsville canal and the Oneida River improvement. It is divided into two repair sections, as follows:

ANNUAL REPORT OF THE

REPAIR SECTION No. 1.

IRA BETTS, Superintendent. MEAD BELDEN, Repair Contractor. Contract expires January 1, 1872.

This section extends from Syracuse to Three River Point, and includes the Seneca river towing-path and Baldwinsville canal; total, twenty-one and a half miles.

The structures are: Four lift stone locks; one composite lift lock; one wooden lift lock; one wooden guard lock; four composite culverts; five iron road bridges; one iron change bridge; eleven wooden road bridges; four wooden change bridges; two floating tow-path bridges; one wooden river dam; three waste-weirs; four lock houses; one State shop.

The expenditures upon this section during the fiscal year, were as follows:

ORDINARY REPAIRS.

By the late Canal Commissioner (total payments for all purposes)	\$14,482 57
By the present Canal Commissioner:	
For compensation of repair contractor ..	\$14,568 70
Miscellaneous expenditures.....	651 73
	15,220 43
By superintendent of repairs	729 91
	\$30,432 91

EXTRAORDINARY REPAIRS.

Rebuilding bridges on change of plan..	\$4,021 70
Rebuilding docks on side cuts at Salina,..	7,480 00
Constructing berme bank on Oswego river	29,204 44
Vertical wall on enlargement sec. No. 4.	3,213 00
	43,919 14
Total on section	\$74,352 05

REPAIR SECTION No. 2.

IRA BETTS, Superintendent. A. C. BELDEN, Repair Contractor. Contract expires January 1, 1874.

This section extends from Three River Point to Oswego, including the Oneida River improvement, forty-three miles. The structures are: Thirteen stone lift locks; five stone guard locks; two steamboat lift stone locks (120x30); five wooden waste-weirs; seven wooden

road bridges; two wooden road and change bridges; six wooden change bridges; one wooden river tow-path and change bridge; two iron road bridges; three stone river dams; six wooden river dams; one aqueduct; one bulk-head; one drawbridge; four composite culverts; twenty lock houses; one State shop.

The expenditures upon this section during the fiscal year were as follows:

ORDINARY REPAIRS.

By the late Canal Commissioner (total payments for all purposes).....	\$15,667 23
 By the present Canal Commissioner:	
For compensation of repair contractor..	\$22,364 94
Miscellaneous expenditures, including \$2,930.07 for repairs of Oswego weigh lock.....	3,651 73

	26,016 67
By superintendent of repairs.....	729 90

	\$42,413 80

EXTRAORDINARY REPAIRS.

Rebuilding bridges on change of plan....	\$3,565 35
Raising the banks.....	2,686 00
Rebuilding dam at Minetto.....	3,842 00
Rebuilding high dam.....	4,216 00
Constructing bulk-head at Farwell's mill.	2,006 00

	16,315 35
Total on section.....	_____
	\$58,729 15

CHENANGO CANAL.

JOSEPH W. FORWARD, Superintendent. Contract surrendered April 15, 1870, under act chapter 55, Laws 1870.

This canal extends from the Erie canal at Utica to the Susquehanna river at Binghamton, ninety-seven miles. It comprises three repair sections, as follows:

REPAIR SECTION No. 1.

This section extends from the junction of the Chenango and Erie canals, in the city of Utica, to the foot of lock 81, one mile south of the village of Hamilton, thirty-one miles. The following reservoirs are located upon it: Madison brook, Woodman's pond, Leland's pond, Bradley's brook, Hatch's lake, Kingsley's brook and

Eaton's brook, all of which are in the southern part of Madison county. Connected with the section are $13\frac{1}{4}$ miles of feeder. Total canal and feeders, $44\frac{1}{4}$ miles. The structures are: Seventy-seven composite lift locks; four stone lift locks; four wooden trunk aqueducts; one stone arch culvert; one guard lock; twelve arch culverts; seven box culverts; nine waste-weirs; three iron bridges; forty-four wooden bridges; thirty bridges on feeders.

This section was under contract for annual repairs with J. J. Belden, until April 15th, 1870, when, with the previous assent of the Canal Board, upon petition to that effect by the contractor, said contract was abrogated. Since that period the superintendent in charge has conducted the ordinary repairs, and had general control of the management of the section.

The expenditures and payments for all purposes on account of this section during the past fiscal year were as follows:

ORDINARY REPAIRS.

By the late Canal Commissioner (total payments for all purposes)	\$5,192 48
By the present Canal Commissioner:	
For compensation of repair contractor ...	\$7,862 47
For compensation of repair contractor for materials, tools, etc.....	8,265 86
Miscellaneous expenditures.....	607 66
	16,735 99

By superintendent of repairs, viz.:

Repairing bridges.....	\$676 19
Repairing breaches.....	2,166 36
Bottoming out canal, spring repairs.....	3,547 54
Repair of locks and new lock gates.	3,529 97
Raising banks.....	649 72
Other repairs, miscellaneous and salaries.	8,570 79
	19,140 57
	\$41,059 04

EXTRAORDINARY REPAIRS.

Repairing break, Capron aqueduct.....	\$33,989 15
Rebuilding locks.....	37,179 00
Deposit to secure annual contract refunded with accrued interest.....	4,866 57
	76,034 72
	\$117,093 76

REPAIR SECTION No. 2.

C. W. OLENDORFF, *Superintendent.* JOHN HULL, *Repair Contractor.* Contract expires January 1, 1873.

This section extends from the foot of lock 81 to and including the first farm bridge above lock 100; distance thirty-four miles. The structures are: Eighteen composite lift locks; eighteen wooden trunk aqueducts; six waste-weirs; nine bridges on feeders; three iron bridges; sixty wooden bridges, thirteen arch culverts.

There are six feeders with an aggregate length of four miles, with dams to the length of one thousand feet.

The expenditures upon this section during the fiscal year were as follows:

By the late Canal Commissioner..... \$3,068 45

.By the present Canal Commissioner :

For compensation of repair contractor.....	7,851 37
For constructing swing-bridge at Norwich.....	2,499 53
Miscellaneous expenditures.....	607 67
Expenditures by superintendent, including salary.....	790 00

\$14,817 02

REPAIR SECTION No. 3.

J. B. WILLMOT, *Superintendent.* Contract surrendered April 15, 1870, under act chap. 55, Laws of 1870.

This section extends from the first bridge north of lock one hundred to the junction of the canal with the Chenango and Susquehanna rivers, in the village of Binghamton, distance thirty-two miles. The Stratton and Chenango Forks feeders are located on this section, the Stratton being about fifty rods in length, with a dam three hundred and fifty feet in length, and having two bridges, one farm, the other towing-path. The Chenango Forks feeder consists of a dam three hundred and fifty feet in length, with a guard lock, having a towing-path bridge across it. The structures are: One stone lift lock; fourteen composite lift locks; one guard lock; two dams; seven waste-weirs; five wooden trunk aqueducts; three iron bridges; fifty-five wooden bridges; ten arch culverts; one bridge on feeder.

This section was under contract for annual repairs with F. N. Lord, until April 15, 1870; when, with the assent previously obtained of the Canal Board, upon petition to that effect by the contractor, said contract was abrogated. Since that period, the superintendent

in charge has conducted the ordinary repairs and exercised immediate control over the section.

The expenditures and payments for all purposes on account of this section during the past fiscal year were as follows:

ORDINARY REPAIRS.

By the late Canal Commissioner (total payments for all purposes).....	\$3,922 50
By the present Canal Commissioner :	
For Compensation of repair contractor....	\$8,100 00
For compensation of repair contractor for permanent improvements, materials and tools	20,812 64
Miscellaneous expenditures.....	607 67
	29,520 31

By Superintendent of repairs, viz. :	
For bottoming down canal.....	\$2,121 00
For repairing bridges.....	1,019 10
For repairing waste-weirs and aqueducts...	385 32
For repairing locks and lock gates.....	991 84
For salaries, lock tending and miscellaneous	5,019 24
	9,536 40
Deposit to secure annual contract refunded with interest	4,835 69
	\$47,814 90

CHEMUNG CANAL.

*SILAS HAIGHT, Superintendent. JARVIS LORD (Assignee), Repair Contractor.
Contract expires January 1, 1872.*

This canal extends from the head of Seneca lake, at Watkins, to Elmira, including the feeder from Horseheads to Knoxville, making a total distance of thirty-nine miles of navigable canal.

The structures are: Two composite locks ; thirteen timber locks ; one timber guard lock ; thirty-eight old timber locks ; four aqueducts ; thirteen waste-weirs ; two culverts ; one dam and bulk-head ; three road bridges, iron ; thirty-five road bridges, wood ; fourteen farm bridges ; one towing-path bridge, wood ; one towing-path bridge across Chemung river.

The expenditures upon this canal during the fiscal year were as follows :

ORDINARY REPAIRS.

By the late Canal Commissioner.....	\$14,707 16
By the present Canal Commissioner:	
For compensation of repair contractor...	\$28,350 00
Miscellaneous expenditures.....	3,706 01
	<hr/>
By superintendents of repairs.....	32,056 01
	774 51
	<hr/>
	\$47,537 68

EXTRAORDINARY REPAIRS.

(Paid partially from ordinary repair fund.)

Repairs of break at Corning.....	\$60,000 00
Cleaning out and deepening State ditch on lands of Willis Sayre	1,598 00
Dredging between Lock No. 1 and Seneca lake.....	3,315 00
Purchase and cost of maintaining State tug to assist boats at Corning and Gibson	5,254 95
	<hr/>
	70,167 95
	<hr/>
	\$117,705 63

CAYUGA AND SENECA CANAL.

JOHN HAGGERTY, *Superintendent.* Contract surrendered April 15, 1870, under act chapter 55, Laws of 1870.

This canal extends from the Erie, at Montezuma, to Seneca lake, at Geneva, with a branch from Lock 9 to East Cayuga, at the foot of Cayuga lake. Total miles in length, twenty-three.

The structures are: Eleven composite lift locks; one side lock at Seneca Falls; nine culverts; one pier at foot of Cayuga lake; one pier at foot of Seneca lake; seven iron bridges; fifteen wood bridges; five dams.

This canal was under contract for annual repairs with Geo. M. Case as assignee of Geo. Collins, until April 15, 1870, when said contract was abrogated by the Canal Board, upon petition to that effect by the contractor. Since the date above given the repairs and immediate supervision of the canal have been confided to the superintendent in charge.

The expenditures and payments for all purposes, for the past fiscal year, have been as follows:

ANNUAL REPORT OF THE

ORDINARY REPAIRS.

By the late Canal Commissioner (total payments for all purposes).....	\$14,862 48
By the present Canal Commissioner :	
For compensation of repair contractor... .	\$9,401 19
For compensation of repair contractor, for tools, materials, etc.....	8,342 44
Miscellaneous expenditures.....	2,793 36

	20,536 19

By superintendent of repairs:

Repairs of Locks	\$4,478 20
New lock gates and repairs of old do....	702 04
Repairs of bridges.....	1,567 00
Ice breakers and under water excavators,	637 52
Raising and repairing banks.....	1,386 16
Docking rebuilt	3,850 45
Bottoming down canal.....	3,599 07
Assisting boats with steam tug from Cayuga to Mud lock, consequent upon delay in rebuilding lock No. 11, and on Geneva level, owing to low water near close of navigation.....	2,351 00
Salaries, lock-tending, and miscellaneous,	7,804 45

	26,375 89

	\$61,774 56

EXTRAORDINARY REPAIRS.

Rebuilding locks Nos. 2, 3, 9 and 11... .	\$23,870 00
Rebuilding bridges on change of plan... .	4,904 15
Repairs of bridges.....	497 84
Awarded A. B. Swarthout, by Canal B'd,	7,629 77
Construction of pier at Geneva.....	3,763 15
Vertical wall at Seneca Falls	1,787 17
Swing bridge near lock No. 11.....	680 00
Excavation of original material near Brick Yard Point, Waterloo (under chapter 867, Laws of 1869).	4,543 28
Protection berme bank along Seneca lake, under chapter 767, Laws of 1870.....	7,028 39

	54,743 73
Total.....	_____
	\$116,518 29

CROOKED LAKE CANAL.

O. G. SHEARMAN, *Superintendent.* O. C. KNAPP, *Repair Contractor.* Contract expires January 4, 1874.

This canal extends from Crooked lake, near Penn Yan, to Seneca lake, at Dresden, distance eight miles. The structures are: Twenty-seven lift locks; one guard lock; six waste-weirs; two culverts; fourteen bridges; four dams.

The expenditures upon this canal, during the fiscal year, were as follows :

By the late Canal Commissioner.....	\$548 96
By the present Canal Commissioner :	
By draft for compensation of repair contractor.....	6,103 12
Expenditures by superintendents (salaries).....	600 00
<hr/> <u>\$7,252 08</u>	

[Assem. No. 6.]

8

ONEIDA LAKE CANAL.

This canal, when completed, will connect the Erie canal with the waters of the Oneida lake, furnishing thirty miles of lake navigation, intersecting the Oneida River improvement, which forms a junction with the Oswego canal at Three River Point.

The expenditures for construction during the fiscal year were as follows :

By the late Canal Commissioner.....	\$24,004 00
By the present Canal Commissioner	132,082 00
Total	<u><u>\$156,086 00</u></u>

FROM THE GENERAL FUND.

On lighthouse at Ithaca.....	<u><u>\$250 00</u></u>
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CHENANGO CANAL EXTENSION.

The expenditures upon this work during the fiscal year were as follows :

By the late Canal Commissioner (total payments for all purposes)	\$66,143 98
By the present Canal Commissioner :	
By draft on auditor and certificates of indebtedness issued	268,017 51
Miscellaneous expenditures	1,774 34
Total	<u><u>\$335,935 83</u></u>

LAND DAMAGES.

Statement showing the aggregate of payments by draft and certificate on account of awards made by the Canal Appraisers for land damages, for the fiscal year ending September 30, 1870.

Erie Canal	\$55,086 50
Oswego Canal, by late Commissioner ...	\$13,883 50
" " present " ... 138,114 14	<u>151,997 64</u>
Extension of Chenango, by late Commis- sioner	\$4,697 30
By present Commissioner	<u>31,293 61</u>
Chemung canal and feeder	35,990 91
Cayuga and Seneca canal	26,919 34
Oneida River improvement	31,837 73
Chenango canal	43,987 32
	5,368 00
Total	<u><u>\$351,187 44</u></u>

ANNUAL REPORT OF THE

STATEMENT showing names of repair contractors, annual compensation, etc.

CANALS.	No. of section.	Names of contractors.	Annual compensation.	Date of contracts.	Expiration of contracts.
Erie	8	Aaron G. Fish	\$18,000	Mar. 1, 1869	Dec. 31, 1873
Chemung	All ..	Jarvis Lord, assignee	36,000	Jan. 1, 1867	Dec. 31, 1871
Chenango	2..	John Hull	9,970	Dec. 1, 1868	Dec. 31, 1872
Oswego	1	Mead Belden, assignee	18,500	Jan. 1, 1867	Dec. 31, 1871
Oswego	2..	A. Cadwell Belden	28,400	Mar. 1, 1869	Dec. 31, 1873
Crooked Lake.....	All ..	Oliver C. Knapp	7,750	Mar. 1, 1869	Dec. 31, 1873

STATEMENTS

ACCOMPANYING THE ANNUAL REPORT OF THE CANAL COMMISSIONER IN CHARGE OF THE MIDDLE DIVISION OF THE NEW YORK STATE CANALS, FOR THE FISCAL YEAR ENDING SEPTEMBER 30, 1869.

Statement showing the canals, feeders and reservoirs in charge of the Commissioner.

CANALS.

	Miles.
The Erie canal from Higginsville, Oneida county, to the county line between Seneca and Wayne counties, including the Oneida, Cowasselon, Chittenango, Limestone, Butternut, Nine Mile Creek, Jordan, Weedsport, Carpenter Creek and Port Byron feeders.....	71.93
The Oneida Lake canal (old).....	7.00
The Oswego canal.....	38.00
The Oneida River improvement	20.00
The Seneca river towing-path.....	5.75
The Baldwinsville canal and improvement to Jack's Reefs.	12.50
The Cayuga and Seneca canal and Cayuga outlet.....	22.77
The Ithaca inlet	2.00
The Chemung canal and feeder	39.00
The Crooked Lake canal	8.00
The Chenango canal.....	97.00
	<hr/>
	323.95
	<hr/>

RESERVOIRS.

	Areas, acres.	Depth, feet.	Length of feeders, miles.
Erieville	340	21½	20
Hatch's lake.....	134	10	8
Eaton brook.....	250	50	8
Bradley brook.....	134	25	3
Leland pond	173	8	½
Woodman's lake	148	11	¼
Madison brook.....	235	45	2
Skaneateles lake	8,320	6	9
Cazenovia lake	1,778	4½	10
De Ruyter	626	18½	25
Otisco lake.....	2,200	10	2
	<hr/>		<hr/>
	14,342		87½
	<hr/>		<hr/>

ANNUAL REPORT OF THE

STATEMENT of work under contract upon the Middle Division of the New York State Canals for the fiscal year ending September 30, 1870.

SERIE CANAL.

OSWEGO CANAL.		CHENANGO CANAL.		CAYUGA AND SENeca CANAL.	
Stone dam at Minetto, Oswego river.....	106,100 Nov. 14, 1866	\$106,100	\$76,565 00	\$55,560 00	\$18,065 00
High dam, Oswego river.....	50,000 July 14, 1869	Nov. 1, 1870	111,000	12,560 00	12,664 00
Bennie Bank, Oswego river.....	180,000 Aug. 13, 1864	April 1, 1868	180,000	170,000	170,000
Bulk-head at Farwell's mill.....	4,000 July 14, 1869	April 1, 1869	4,000	4,000	4,000
Deepening Oswego river, at Oswego.....	40,000 Dec. 1, 1869	Dec. 1, 1869	41,150	36,000	36,000
Vertical wall on enlargement section No. 4.....	4,000 July 14, 1869	July 14, 1869	4,000	3,400	3,400
Raising banks, etc., of Oswego canal.....	31,000 July 14, 1869	Dec. 1, 1869	31,000	32,570	32,570
Rebuilding docks on south cuts at Salina.....	25,000 July 14, 1869	Dec. 1, 1869	25,000	19,750	19,750
Iron bridge at First street, Fulton.....	4,000 July 14, 1869	Dec. 1, 1869	4,000	9,400	9,400
Iron bridge at Division street, Syracuse.....	3,400 July 27, 1869	Dec. 1, 1869	3,400	2,925	2,925
Iron bridge at Beane street, Syracuse.....	3,236 Aug. 1870	Sept. 1, 1870	3,236	3,460	3,460
Iron foot bridge at Durston's drydock, Syracuse.....	2,300 Aug. 1870	Sept. 1, 1870	2,300	2,300	2,300
Iron bridge at Cold Spring.....	2,300 July 14, 1869	Dec. 1, 1869	2,300	4,716	4,716
Culvert near Haskin's Salt Block, below Salina.....	21,620 Feb. 4, 1870	April 1, 1870	21,620	21,174	21,174
Total .....	.....	.....	.....	\$538,620	\$444,360 79
				\$65,362 04	\$280,023 04
					\$154,747 75
Rebuilding lock No. 18.....	\$11,901 Jan. 5, 1869	APR 20, 1869	\$11,901	\$11,901	\$11,901
Rebuilding lock No. 19.....	13,160 Jan. 5, 1869	APR 20, 1869	13,160	13,160	13,159
Rebuilding lock No. 22.....	20,937 Jan. 5, 1869	APR 20, 1869	20,937	20,937	20,937
Rebuilding lock No. 106.....	11,000 Oct. 16, 1865	APR 1, 1866	10,000	6,701	6,701
Rebuilding lock No. 106.....	9,000 Oct. 16, 1865	APR 1, 1866	9,000	5,747	5,747
Rebuilding lock No. 107.....	12,500 Sept. 18, 1865	APR 1, 1866	12,500	9,639	9,639
Swing bridge at Canal street, Norwich.....	3,000 Sept. 23, 1869	APR 1, 1870	3,000	2,499	2,499
Swing bridge at Genesee street, Greene.....	5,000 Sept. 23, 1869	APR 1, 1870	5,000	3,864	3,864
Iron bridge at Henry st., Binghamton.....	2,000 July 1, 1870	Sept. 15, 1870	2,000	1,998	1,998
Iron bridge at Court street, Binghamton.....	7,945 Aug. 3, 1870	Nov. 1, 1870	7,945	5,722	5,722
Total .....	.....	.....	.....	\$85,203	\$81,979 56
				\$48,287 31	\$48,287 31
					\$33,723 26
Pier at Geneva.....	\$30,887 July 22, 1868	July 14, 1869	\$30,887	\$17,754 15	\$17,754 15
Dredging channel at Cayuga inlet, Ithaca.....	37,000 Sept. 23, 1869	Sept. 23, 1869	37,000	39,446 00	39,446 00
Iron bridge at Ovid street, Seneca Falls.....	15,000 Sept. 23, 1869	Sept. 23, 1869	15,000	12,000	12,000
Iron needles beams in bridges, at Geneva and Waterloo.....	7,000 May 1, 1870	APR 1, 1870	7,000	5,800	5,800
Vertical wall on beam, at Seneca Falls.....	3,000 May 1, 1870	APR 1, 1870	3,000	3,000	3,000
Swing bridge near lock No. 11.....	2,070 May 1, 1870	APR 1, 1870	2,070	1,800	1,800
Iron bridge at Canal street, Waterloo.....	3,700 May 1, 1870	APR 1, 1870	3,700	2,907	2,907
Total .....	.....	.....	.....	\$86,194	\$88,886 67
					\$55,225 67

Statement—(Continued).

CHEMUNG CANAL.

CHARACTER OF WORK.	Appropriation.	When let.	When to be completed.	Eng.- ineer's es- timate.	Estimated cost at con- tractors' prices.	Amount done during fiscal year.	Total amount done.	Amount remaining to be done.	Remarks.
Dredging from lock 1 to Seneca lake.	\$15,000	Sept. 23, '69	Sept. 1, '70	\$15,300	\$11,860.00	\$5,100.00	\$5,100.00	\$6,750.00	.....
Cleaning out State ditch on farm of W. Sayre, etc.	4,700	July 14, '69	Dec. 1, '69	4,700	4,367.90	3,320.00	3,320.00	847.90	.....
Raising and extending breakwater at Watkins.	30,000	Aug. 2, '70	Nov. 1, '70	20,000	16,575.00	.....	.....	16,375.00	.....
Taking up old lock and constructing culvert at Elmira	7,000	Aug. 2, '70	Nov. 1, '70	7,000	4,050.00	.....	.....	4,050.00	.....
Total	.....	.....	.....	.....	.....	.....	.....	.....	.....
				\$47,000	\$36,842.96	\$8,680.00	\$8,680.00	\$28,222.96	.....

BALDWINSVILLE CANAL,

Iron bridge at Bridge st., Baldwinsville ..	\$6,500	July 14, '69	Dec. 1, '69	\$6,500	\$5,459.70	\$3,912.70	\$5,459.70	Settled.
Total .....	.....	.....	.....	\$6,500	\$5,459.70	\$3,912.70	\$5,459.70	.....

ONEIDA LAKE CANAL.

STATEMENT showing engineer's estimate, estimated cost at contract prices, estimated cost at prices fixed under Laws of 1869 and 1870, amount done, and remaining to be done, and amount done during fiscal year.

Statement—(Continued).
EXTENSION OF CHENANGO CANAL.

CHARACTER OF WORK.	When let.	When to be completed.	Engineer's estimate.	Estimated cost at contract prices.	Amount done during fiscal year.	Total amount done.	Amount remaining to be done.	Remarks.
Length of canal, in feet.	Appropriation.							
63	Section No. 1.....	June 22, '65	Sept. 1, '66	\$7, 878 88	\$8, 681 93	\$7, 878 88	\$1, 711 93	Canceled October, 1867.
"	Section No. 1.....	July 26, '68	April 1, '70	14, 890 00	11, 711 98	8, 860 00	6, 986 00	Completed.
"	River bank or towing-path seen.	July 14, '69	Nov. 1, '70	34, 000 00	18, 000 00	29, 086 87	7, 309 00	Canceled October, 1867.
71	Section No. 2.....	June 22, '65	Sept. 1, '66	23, 186 87	25, 086 87	54, 020 00	46, 320 00	Relief.
"	Section No. 2.....	July 26, '68	April 1, '70	60, 471 50	30, 385 72	30, 385 72	30, 385 72	Canceled October, 1867.
80	Section No. 3.....	June 22, '65	Sept. 1, '66	30, 385 72	6, 020 88	6, 020 88	6, 020 88	Canceled Nov., 1869, and attached to section 4.
"	Section No. 3.....	July 26, '68	April 1, '70	6, 020 88	6, 020 88	6, 020 88	6, 020 88	Canceled October, 1867.
80	Section No. 4.....	June 22, '65	Sept. 1, '66	40, 523 61	40, 523 61	22, 060 00	40, 523 61	Canceled October, 1867.
"	Section No. 4.....	July 26, '68	Sept. 1, '66	90, 365 60	89, 888 00	57, 485 02	90, 365 60	Relief.
90	Section No. 5.....	June 22, '65	Sept. 1, '66	67, 385 02	57, 485 02	32, 225 00	1, 520 00	Canceled October, 1867.
"	Section No. 5.....	July 26, '68	April 1, '70	32, 900 00	24, 745 00	39, 927 81	39, 927 81	Relief.
90	Section No. 6.....	June 22, '65	Sept. 1, '66	89, 227 81	10, 593 89	10, 593 89	10, 593 89	Canceled June, 1869.
"	Section No. 6.....	July 26, '68	April 1, '70	10, 593 89	31, 119 00	17, 360 00	17, 360 00	Relief.
80	Section No. 6 and part of 7.....	July 26, '68	Nov. 1, '69	25, 890 00	25, 890 00	21, 730 65	21, 730 65	Completed.
"	Section No. 7.....	June 22, '65	Sept. 1, '66	53, 095 00	81, 736 85	53, 095 00	81, 736 85	Completed.
80	Section No. 8.....	June 22, '65	Sept. 1, '66	21, 188 00	29, 636 93	29, 636 93	29, 636 93	Completed.
"	Section No. 9.....	July 26, '68	April 1, '70	12, 745 00	19, 427 52	19, 427 52	19, 427 52	Completed.
80	Section No. 10.....	June 22, '65	Sept. 1, '66	6, 692 62	6, 692 62	6, 692 62	6, 692 62	Canceled October, 1867.
"	Section No. 10.....	July 26, '68	April 1, '70	13, 100 00	15, 556 20	3, 476 20	15, 556 20	Completed.
76	Section No. 11.....	Feb. 7, '66	Sept. 1, '67	30, 650 00	26, 048 88	26, 048 88	26, 048 88	Completed.
81	Section No. 12.....	Feb. 7, '66	Sept. 1, '67	17, 050 00	18, 500 66	18, 500 66	18, 500 66	Completed.
80	Section No. 13.....	Feb. 7, '66	Sept. 1, '67	12, 180 00	8, 284 47	8, 284 47	8, 284 47	Completed.
80	Section No. 14.....	Feb. 7, '66	Sept. 1, '67	13, 180 00	13, 080 16	13, 080 16	13, 080 16	Completed.
"	Section No. 14.....	July 26, '68	April 1, '70	10, 210 00	9, 222 72	9, 222 72	9, 222 72	Completed.
80	Section No. 15.....	Feb. 7, '66	Sept. 1, '67	9, 008 86	9, 008 86	9, 008 86	9, 008 86	Completed.
"	Section No. 15.....	July 26, '68	April 1, '70	10, 850 00	6, 989 80	6, 989 80	6, 989 80	Completed.
80	Section No. 16.....	Feb. 7, '66	Sept. 1, '67	22, 650 00	13, 455 68	13, 455 68	13, 455 68	Completed.
82	Section No. 17.....	Feb. 7, '66	Sept. 1, '67	18, 450 45	18, 450 45	18, 450 45	18, 450 45	Completed.
"	Section No. 17.....	July 26, '68	April 1, '70	25, 700 00	13, 946 98	13, 946 98	13, 946 98	Completed.
88	Section No. 18.....	Feb. 7, '66	Sept. 1, '67	36, 311 34	36, 311 34	46, 098 00	46, 098 00	Canceled October, 1867.
"	Section No. 18.....	July 26, '68	April 1, '70	46, 098 00	11, 280 50	11, 280 50	11, 280 50	Completed.
80	Section No. 19.....	Feb. 7, '66	Sept. 1, '67	40, 952 32	38, 777 18	38, 777 18	38, 777 18	Completed.
80	Section No. 20.....	Feb. 7, '66	Sept. 1, '67	10, 850 46	10, 850 46	10, 850 46	10, 850 46	Canceled October, 1867.
80	Section No. 21.....	June 15, '66	May 1, '67	44, 700 00	44, 830 94	44, 830 94	44, 830 94	Completed.
"	Section No. 21.....	July 26, '68	May 1, '67	65, 100 00	76, 971 86	76, 971 86	76, 971 86	Completed.
85	Section No. 22.....	June 15, '66	May 1, '67	12, 060 00	29, 219 55	29, 219 55	29, 219 55	Canceled.
79	Section No. 23.....	June 28, '66	May 1, '67	9, 389 20	9, 389 20	9, 389 20	9, 389 20	Relief.
80	Section No. 24.....	Nov. 11, '69	Nov. 1, '70	45, 000 00	30, 972 50	30, 972 50	30, 972 50	Relief.

STATEMENT showing the work not under contract.
EXTENSION OF CHENANGO CANAL.

CHARACTER OF WORK.	Engineer's estimate.	Remarks.
Four wooden locks, including		.....
Guard lock.....	\$91,573 00	.....
Wappasena aqueduct.....	25,000 00	.....
Little Wappasena aqueduct.....	20,000 00	.....
Ellis aqueduct.....	25,000 00	.....
Culverts on sections Nos. 31 to 38 inclusive.....	88,000 00	.....
Bridges on sections Nos. 31 to 38 inclusive.....	44,200 00	.....
Total.....	\$343,773 00	.....

*STATEMENT of authorized work upon miscellaneous repairs, under the supervision of the Engineer Department,
for the fiscal year ending September 30, 1870.*

ERIE CANAL.

CHARACTER OF WORK.	How authorized.	Appropriation on engineer's estimate.	Amount done.	Amount paid.	Remarks.
Inserting iron needle beams in bridge at Brutus street, Weddsport	By commissioner upon change of plan.	\$1,578 42	\$1,697 23	\$1,578 42	Old structure deducted.
Inserting iron needle beams in bridges at William McBride and Clinton streets, Syracuse, and at Genesee street, Geddes	By commissioner upon change of plan.	4,842 15	5,207 55	4,842 15	Old structure deducted.
Inserting iron needle beams in bridge at Potowmack street, Canastota	By commissioner upon change of plan.	960 10	1,057 30	960 10	Old structure deducted.
Inserting iron needle beams in bridge at Crane Brook, and Doughtery bridge, in Port Byron	By commissioner upon change of plan.	2,005 88	2,198 83	2,005 88	Old structure deducted.
Rebuilding and setting back berme abutment and connecting iron bridge at Basin street, Geddes	By commissioner upon repair contract.	12,935 49	12,986 19	12,935 49	.....
State ditch, extending from Erie canal, northerly, into Owasco creek	By commissioner upon change of plan.	5,086 85	5,959 28	5,086 85	Materials and old structure deducted.
Protecting banks on section No. 7, by refilling with brush and stone	Act, chap. 877, Laws of 1866	1,756 00	1,756 00	1,756 00	.....
Bottoming down east of lock No. 47	By commissioner upon change of plan.	9,286 90	11,387 50	9,286 90	To refill with earth deducted.
Removing waste-weir, etc., at Cowaseecon creek	Act, chap. 877, Laws of 1869	40,000 00	36,445 87	34,346 62	Earth above original bottom deducted.
Removing wall benches on the Jordan level	By commissioner under repair contract.	21,000 00	19,300 00	19,300 00	.....
	By commissioner under repair contract.	16,005 00	18,005 00	18,005 00	.....
				\$116,161 73	

OSSWEGO CANAL.

Inserting iron needle beams in bridges at James street, Syracuse and Salina, and Park street, Salina	By commissioner upon change of plan.	\$4,171 56	\$4,651 86	\$4,171 56	Old structure deducted.
Inserting new iron beams in bridge at First st., Fulton	By commissioner under repair contract.	638 75	639 20	639 75	Materials delivered deducted.

CAYUGA AND SENeca CANAL.

Renewing floor joists in bridges at Geneva and Waterloo	By commissioner under repair contract.	\$497 84	\$640 08	\$497 84	Old structure deducted.
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Statement — (Continued).
CHENANGO CANAL.

CHARACTER OF WORK.	How authorized.	Appropria- tion or engineer's estimate.	Amount done.	Amount paid.	Remarks.
Raising the feeder banks at Oxford.....	By canal board under repair contract.	\$800 00	\$800 00	\$800 00	
Rebuilding the aqueduct at New Hartford.....	By commissioner under repair contract.	38,969 15	38,569 15	38,568 15	
				\$34,886 15	
 CHEMUNG CANAL.					
Repairing dam at Gibbon.....		\$60,000 00	\$60,000 00	\$60,000 00	

SUMMARY.

Amount of work done during the fiscal year.

CANALS.	Work under contract.	Work upon miscellaneous repairs.	Total.
Erie, including Otisco Lake reservoir.....	\$108,834 87	\$116,161 73	\$224,996 60
Oswego.....	65,362 04	5,227 65	70,589 69
Cayuga and Seneca	56,225 67	640 08	56,866 75
Chemung	8,630 00	62,226 60	70,866 60
Chenango	48,257 31	34,889 15	83,146 46
Oneida Lake (enlargement).....	199,440 00	.....	199,440 00
Baldwinsville.....	3,912 70	.....	3,912 70
Chenango extension.....	308,759 18	.....	308,759 18
	\$794,411 77	\$219,145 21	\$1,013,556 98

MANAGEMENT OF THE CANALS.

Within the past season, pursuant to the Law of 1870, the contract system has been abolished, and a large proportion of the contracts have been voluntarily surrendered by the contractors.

If the remainder of them are permitted to expire by their own limitation, some of them have yet to run three years, but the most important of them expire at the end of another year.

When this question was under consideration in the Legislature, a proposition of a more sweeping nature, viz., to abolish the system and abrogate the contracts at one and the same time, was negatived by a decided majority, and the present law substituted, which permits contractors to surrender their contracts, and the Canal Board on the recommendation of the Board of Commissioners to make a forced cancellation of any or all of them.

It will be seen that this law placed a heavy responsibility upon the Commissioners, for most of the forwarders and boatmen were at first clamorous in their demands that all these contracts should be wiped out at once, notwithstanding the action of the Legislature; in other words, that the Commissioners should entirely disregard the feature of the law which charged them to consider the interest of the State, and determine the question accordingly.

The undersigned believed that the boatmen had the right to demand an improved and a good navigation, and that the true interest of the State could only be subserved by securing this, at the smallest possible cost. Wherever and whenever the contractors kept their sections in as good order as other and similar work was kept by superintendents, there would be little doubt about which method was most economical, and there was no way to determine the relative cost, except to permit the contractors to make the trial. The trial was made, and with decided success in every instance of the contracts remaining on the Middle Division, so far as navigation is concerned; as to the question of economy, the answer will be found in the tables annexed to this report.

The superintendent system was discarded by common consent a few years ago. It was found to be uniformly extravagant, and sometimes both extravagant and corrupt. The contract system was substituted, and this in turn has been discarded. No effort was ever made to amend and improve it. Whether it might have been so modified as to have secured the true purposes of any system, viz., economy and efficiency, it is now too late to inquire.

The Commissioners being executive officers, should administer any system of repairs which the Legislature in its wisdom shall devise with fidelity and whatever of ability they may possess. They should exercise such discretion as the law permits, in improving it, and they should suggest such necessary modifications as can only be accomplished by amendments to the law.

It is quite probable that the Legislature returned unwillingly to the employment of superintendents; but in the determination to get rid of the contract system no other alternative was presented.

Can we take care of and preserve the property of the State and keep the canals in good navigable order, with reasonable economy, through superintendents?

In the judgment of the undersigned this will only be accomplished by confining *their* expenditures to a portion, and generally to a small portion, of the whole cost of repairs. The major part of these expenditures are for work susceptible of an accurate measurement, and such work should, in the discretion of the Commissioner, be made the subject of a contract. The laws in regard to advertising lettings should be revised. In addition to the requirement to advertise extraordinary repairs, the Commissioners should have discretionary power to advertise ordinary repair work in such manner and for such period as in their judgment the public interest may require. The proposed change would not impair the efficiency of the superintendents, their ability to maintain good navigation, and to watch and guard the mechanical structures, and the banks of the canal, and be ready to attend to the reparation of breaks, and all other exigencies of navigation. At the same time it would emancipate them from the influences with which they are surrounded, which always tend in the direction of expenditure, and generally to local and personal objects, or to the employment of worthless persons merely for their political services. This modification would be entirely free from the objections which were made to the late contract system, and which undoubtedly led to its repudiation. Nobody would have an interest in leaving anything undone which would contribute to a perfect navigation.

That the evils above specified are inherent in the old superintendent system, hardly admits of a question, for it has been tried, and always with about the same result, under the ablest and purest Commissioners who have ever served the State, and under all political parties.

It would, however, be unjust to the superintendents now employed by the State to judge them solely by the sums of their expenditures for the past year, for they uniformly took charge of the most neglected portions of the canal.

The surrendered sections had, for many years, in almost every instance, been under contract at non-compensating prices, and there was a very large amount of work required to restore them to a proper condition. This work has been promptly and well done. And even if they have in every instance performed it with the most rigid economy, the proposed reform will work no injustice to them. On the contrary, it will enable them to make a most favorable contrast with the past, when they desire to establish a character for economy.

That feature of the law of 1870 which permits the appointment of patrolmen has been severely criticised, and doubtless is subject, like many other laws, to great abuses. Yet the undersigned is of opinion that it is a wise provision, and has been most efficient in securing the improved navigation which all concede we have enjoyed for the past season.

It is within the knowledge of the Commissioner that at least one expensive and ruinous break on the Montezuma marshes was arrested by the vigilance, promptness and good judgment of a patrolman, and this alone was worth ten-fold more to the interests involved than the cost of all the patrolmen which have been hitherto employed.

CLEANING UP AND REMOVING MATERIAL FROM THE PRISM OF THE CANAL IN THE SPRING.

By an examination of the details of superintendents' reports, it will be found that this department of expenditure embraces a large share of the annual cost of opening the canals.

This kind of work, or rather this method and time of performing the work, should always be avoided when possible without detriment to the immediate wants of navigation. The cost is always excessive, and often fabulously high. The hurry, confusion, and want of economy in attempting to force the work, with great crowds of laborers, added to the liquid condition of the material and the employment of unskilled foremen to direct the work, will account for its enormous cost.

When the canals closed last fall, it is admitted by boatmen that their condition was entirely satisfactory, and they should be equally so in the spring, excepting only the bars filled in by the rains and floods

of winter. These, and these only, should be removed by wheeling out, carting or casting up. It will probably be found desirable, in the fluctuation of the levels, especially during droughts, to remove accumulations of sediment, but this may be done without detriment to navigation, and with comparative economy, by dredging.

CANAL CLAIMS.

The enlargement account was closed in 1862, and it was then so generally supposed that the mission of the Canal Appraisers had been fulfilled, that serious efforts were made to abolish the board on account of having apparently so little remaining business.

But millions of dollars of canal claims have been paid or have become due since that date, and it is understood that the number now filed and pending has been equaled at no other time.

It is the duty of the Commissioner on his own division, to inquire into the facts concerning these claims, and endeavor to keep them within reasonable limits; to procure the attendance of witnesses on the part of the State; and when it is suspected that a claim has no sound basis in law or equity, if all the evidence bearing on the case is fairly presented, to take especial pains to look up testimony for the State. This is frequently a difficult task, and is rendered in many cases almost if not quite impracticable, by the antiquity of the claims presented.

The most important witnesses in behalf of the State, in many cases, are ex-commissioners and engineers, under whose supervision the work was conducted. Many of these are now numbered among the dead, others are no longer in the service of the State, and it is frequently difficult or impossible to obtain their testimony. The undersigned submits that these claims can hardly be fairly investigated, under such circumstances, by any tribunal, if no further provision is made to protect the State; yet he is confident that the present board can and will deal with these formidable obstacles, with as much of intelligence, candor and fidelity to the State, as any tribunal which has hitherto existed or can be created. In other words, these claims are resurrected, perfected and presented for a hearing, not because we have a board of appraisers, but because the Legislature, in its anxiety to extend proper facilities to honest claimants, opens the door too wide in special laws, and a great deal wider in general laws. The chronic evil from which the State has so long suffered was greatly aggravated by the Law of 1870.

It is respectfully recommended that this law be materially modified, if not repealed. It certainly ought not to embrace any claim which arose prior to 1854, the date when the enlargement was resumed, and no claim older than six years, except for the appropriation of land or water. It cannot have been the design of the Legislature to *invite claims* against the State, or to persuade citizens that they have been injured by the construction or improvement of our canals, who had passed many years of their lives unconscious of it.

Whatever may have been the design, such has been the effect of this law, as will be apparent by examining the records of the board subsequent to its enactment.

SUPPLY OF WATER.

The late Commissioner in charge of this division, in his last annual report, predicted that the additional quantity of water stored in Otisco lake would be found very useful on repair section No. 9, and supply a necessity hitherto existing for more water on that section, particularly on the Jordan level.

The experience of the past season fully verifies this prediction, and leaves little to be desired in regard to the supply of water for this portion of the canal, excepting to store it in the same manner on the Owasco lake. When this is accomplished, it is believed that the Erie canal, between Lodi locks and Clyde, will have a sufficient supply to maintain a perfect navigation in the dryest seasons, and, also, for any increase of tonnage within the capacity of this canal.

The Syracuse level, and the upper levels of the Oswego canal, have almost uniformly been kept up by the lockages, without feeding from the east or west. If this can be done with the limited business of 1870, it may be safely assumed that with any material increase of lockages in the future, we shall have a surplus, and it is scarcely possible in any event that we shall have any trouble in supplying the wants of navigation, and the demands for hydraulic power at the salt pumps.

LONG OR ROME LEVEL.

The necessity for more water on this level is conceded by all who have had occasion to examine the subject; but as to the sources of supply, and the points at which it should be brought into the canal, there is some diversity of opinion among canal officials. On the 19th of October, 1869, the Canal Board adopted the plans and estimates

for the Fish Creek feeder. The work was advertised to be let, but a delay occurred in making the contracts, which, coming to the knowledge of the Legislature, seems to have resulted in virtually instructing the Board to review its decision on this scheme, as it authorized said Board to apply the appropriation to Fish Creek feeder, "or to the construction of *any* feeder or reservoir which will supply the present deficiency of water on the Long or Rome level."

As the duty of making these contracts devolved upon the Board of Commissioners, it was deemed desirable by that body, in the absence of any additional information from the Canal Board, before proceeding to create obligations on the part of the State to the extent of a million of dollars or more, that a careful and searching review of the whole question should be made, with the hope of avoiding, if possible, embarking at this time in so expensive an undertaking.

To this end the latter board, acting under authority of the law of 1848, appointed, in June last, Charles A. Olmsted, Esq., of Lockport, as an "agent" of the State to conduct the necessary surveys and examination. Mr. Olmsted had no preconceived opinions or prejudices on this subject, and from his large experience and high professional character as well, seemed to be a proper referee to report on a question which will involve an expenditure or saving of a vast sum of money to the State. His elaborate and exhaustive report, a copy of which is herewith submitted, fully justifies his selection for this duty.

In view of the heavy falling off of the canal revenues in the past season, and the apprehension of many of our citizens that they are not soon, if ever, to be restored, we are admonished to avoid all expensive or questionable projects, and to circumscribe, within the narrowest limits possible, every expenditure necessary for the maintenance of a good navigation.

After the experience of the past season, it should not be asserted that the large supply of water which it is estimated will come from Fish creek, will be needed for many years to come, if ever, *on the eastern end* of the Rome level.

The summer of 1870 was, probably, the warmest and dryest for the last half century; hence the evaporation was enormous, and most of the springs and smaller tributaries of the feeders and reservoirs were exhausted by midsummer. Nevertheless, it is conceded on all hands that there was less detention from low water, on this level, than in any year since the draft of boats was fixed at six feet. The cutting

down of canal bottom, for about five miles west of Syracuse, contributed greatly to an improved navigation; but a reform in the management of the feeders initiated and carried out during the past season, for the first time, has demonstrated the great value of system, economy, and the "one man power" in the control of this level.

Hitherto, the level being divided between the Eastern and Middle Divisions, its management was under the control of some half a dozen superintendents, who, with little communication with each other, and often working at cross purposes, were pretty sure to have *some* part of the level, at times, too low for the free passage of fully laden boats, or the water so high as to be running to waste.

To avoid this evil, it was arranged between the Commissioners in charge of the two divisions, that a special agent should be appointed who should devote his entire time to regulating the feeders, and to see that no water was *stolen* or wasted.

For this duty the Board of Commissioners appointed Philip P. Midler, Esq., of Syracuse, whose skill, industry and fidelity are fully vindicated by his remarkable success in passing loaded boats over this level throughout the season, substantially without delay for the first time in the history of our enlarged canals.

The most copious and enduring of the present sources of supply are at a great distance from the canal, like Erieville and De Ruyter; hence, if through mismanagement or accident, the water gets low, many hours, and even days are consumed in replenishing the level, and it is hardly practicable to so nicely gauge the supply as not to waste more or less. One or two reservoirs of moderate size, anywhere on the western portion, located near the canal, would be exceedingly useful in regulating this level, for they could be drawn upon and shut off without causing any delay, or making any waste. The want of water is on the western portion of the long level, especially during the prevalence of strong westerly winds.

The entire supply which is estimated to come from Fish creek, would at times afford no relief, brought in at Fort Bull, near Rome. This is demonstrated beyond all question by the fact that boats have occasionally grounded at Manlius and that vicinity, while the water was flowing freely over the aqueduct and waste-weir at Durhamville; and this trouble was remedied, not by an additional supply at Rome, but by increasing the supply from the feeders west of Durhamville.

In consideration of the relative cost of the proposed reservoirs and

feeders for an additional supply of water for this level, of their utility in improving navigation, and the necessity of their construction to provide for the anticipated increase in the tonnage of the canals as compared with the season of 1870, it is believed that they should be constructed in the following order :

1. *The Cowasselon reservoir*, because the creek for some half a mile or more up the stream from the canal runs through a peculiar light gravel, which is washed into the prism of the canal, through the feeder, or into the creek at the aqueduct in immense quantities by almost every summer shower. It is proposed to place the dam above this material.

By constructing this reservoir, we shall have an important auxiliary to existing sources of supply only about one and a half miles from the canal, and can store and utilize the water which hitherto has been a constant source of annoyance and expense.

2. *Reservoir No. 1*, above Jamesville, on Butternut creek, possesses the merit of bringing water to the canal near the western extremity of the Long level, for nearly the entire distance, through a large, walled and perfectly finished feeder. The work can be performed for the moderate sum of about \$34,000 for construction, and involves the flowage of about 240 acres of land.

3. *Increasing the capacity of De Ruyter reservoir*.—This is the cheapest source yet discovered; and according to the best information which can be obtained without positive demonstration, it can be filled in *any* season, but it is less desirable on account of its great distance from the canal (some twenty-five miles), and hence it is thought to be safer to construct the other reservoirs first.

For the detailed estimates of cost of each of these reservoirs, reference may be had to the accompanying report of Mr. Olmsted, as also for the cost and value of other sources of supply not mentioned above.

The Fish creek project should be abandoned for the following reasons :

First. Its cost, independent of land damages and damages resulting from the diversion of water, is estimated at nearly \$700,000. In the history of our canals most works of considerable magnitude have cost from seventy-five to one hundred per cent beyond the original estimate made by the engineers.

Hence it may be safely assumed that the cost of construction alone will far exceed the above named sum; and if we add thereto land

damages and the heavy demands of the owners of hydraulic power on the Oswego river, which are certain to grow out of this diversion, the final footing of this account may reach one to two millions.

In 1860, State Engineer Richmond warned the Legislature in his report that "the diversion of the water of Fish creek to the canal would diminish to a more or less extent the machinery on the Oswego river, and decrease the tonnage or resources of the canals."

Second. The construction of this heavy work is pretty certain to consume two entire seasons, and will be liable to breaks at the heavy embankments, made of fine sand (the only material available), and to slides in the deep cuts.

Third. The feeder comes into the canal on a portion of the long level where no additional supply is needed, after completing repairs on the Black river reservoirs, and will not relieve that portion of it where water is most wanted. It will be seen by reference to the report of Mr. Olmsted, that we could get nearly 15,000 *cubic feet per minute*, if it is ever wanted, without resort to either branch of *Fish creek*, and that at a largely reduced cost, bringing the feeders into the canal at such points as experience has demonstrated it is most needed. By adopting this policy, the State will need to furnish the money which these reservoirs will cost only as fast as the exigencies of navigation will require.

Finally:

Reservoirs are much more reliable for feeders than what are termed "living streams." Many of the latter in this State, within the memory of the present generation, afforded quite as much of a summer supply of water as Fish creek, which now are reduced to mere rivulets in a dry time.

The clearing away of the forests, and the draining of those natural reservoirs, called swamps, have produced this change, and similar causes must eventually produce similar consequences to Fish creek.

At present there is no lack of water east of Rome. It will be seen in the report of Mr. Olmsted, that owing to the manner of constructing the canal on this level (being originally made perfectly horizontal from end to end), the water flows eastward with more than twice the velocity from the Mohawk feeder than it does westward; so that when water is freely drawn from the sources west of Rome, none of the Mohawk water flows west. When the business of the canal reaches the maximum anticipated by the State Engineer, then, and not until then, will it be desirable to increase the supply at Rome

to such an extent. Then if it shall be necessary to divert the waters of Fish creek, the east branch can be turned into Canada and Wood creeks, at one-eighth the cost of Fish Creek feeder, and will furnish an ample supply east of Rome for the largest trade the canal can accommodate, and this can be compensated by reservoirs, or by the diversion of the waters of Salmon river.

If the construction of Cowasselon reservoir is promptly ordered, it may be so far completed as to be brought partially into use this year, before the usual fall rains; and while no great quantity of water would thus be accumulated, its construction would save much inconvenience and expense from the washing down of gravel.

If these two reservoirs, viz., at Cowasselon and Butternut creek, are completed during the coming season, no further expenditure is deemed necessary, unless an appropriation is made for completing and bringing into use the Oneida Lake canal; in which case another reservoir on Butternut creek, or the enlargement of De Ruyter, should be put under contract. It is estimated that the opening of this canal will increase the consumption of water about sixteen hundred cubic feet per minute—considerably less than the additional quantity we shall get from Black river this year; but as this would leave too narrow a margin for any considerable increase of tonnage, it will be but prudent to make this provision. We can hardly have a warmer or a dryer season than 1870, when existing sources of supply were sufficient, but we hope for an increase of tonnage which should be provided for.

All of which is respectfully submitted.

WM. W. WRIGHT.

REPORT ON THE DEMAND AND SUPPLY OF WATER
FOR THE ROME LEVEL OF THE ERIE CANAL.

To the Honorable the Board of Canal Commissioners of the State of New York:

GENTLEMEN.—Under instructions from Commissioner Wright, I have been making investigations relating to the demand and supply of water for that portion of the Erie canal extending from lock 39 at Little Falls to lock 50 at Geddes.

Having completed my examinations, I beg leave to present the following report :

The demands for water are :

1st. *Filling the canal at opening of navigation.*—This need not be taken into account, because the surplus of the season always fills the canals.

2d. *Evaporation and filtration* are estimated at 222 cubic feet per minute. [See annexed paper A for the particulars.]

There are $78\frac{7}{8}$ miles of canal to be supplied, requiring cubic feet per minute..... 17,460

3d. *Lockages.*—The State Engineer estimates the capacity of the canal at 720 lockages per day, or thirty per hour ; it is thought two locksfull will pass three boats ; this gives twenty locksfull per hour, or one every three minutes. Locks 39 and 47 are both ten and a half feet lift ; the cubic contents of one lockfull is $21,295\frac{1}{2}$, say 21,300 cubic feet, giving, for the two locks, 39 and 47, 42,600 cubic feet every three minutes, and for one minute..... 14,200

4th. *Leaks at mechanical structures.*—There should be a reasonable degree of care used in keeping these structures in good repair to prevent leaks. At a lock, fifty-two square inches aperture ought to be sufficient allowance for leakage ; this on a lock ten and one-half feet lift, gives 360 cubic feet per minute for one lock ; 720 for a pair of locks, and for two pair of double locks..... 1,440

For other mechanical structures allowance is made under the second head.

5th. *Flushing boats from the locks.*—This is a vicious practice and ought not to be permitted. It causes the lower gates often to slam together with great violence ; but it must be taken into account. It has been usual to allow one-fourth of the amount of the leakages for this purpose ; I think one-eighth will suffice if lock tenders are cautioned to desist, say..... 1,800

6th. <i>To supply weigh locks at Utica and Syracuse.</i> —The leaks at these structures waste more than the weighing of boats. I allow Utica 750 and Syracuse 1,200 cubic feet per minute	2,000
7th. <i>Oneida Lake canal.</i> —(See paper D.).....	1,612
8th. <i>The Syracuse level.</i> —The special committee of the Legislature in their report, dated March 18th, 1870, estimate the quantity discharged from these levels to be 42,926 cubic feet per minute. I am satisfied that the committee fell into a great error (see paper B annexed hereto). Lock 47 discharges into this level, or is to do so when the capacity of the canal is reached, 7,100 cubic feet per minute..... 7,100	
The Geddes lock is seven feet lift and will pour into this level..... 4,660 cubic feet per minute.	
The leaks of lock 47..... 720 " "	
The leaks of lock 50..... 585 " "	
Flushing boats..... 1,800 " "	
Making a total of..... <u>14,865</u>	" "

The quantity required to sustain the navigation will be as follows, viz.:

For the weigh lock.....	1,250 cubic feet per minute.
" evaporation and filtration for the Erie and Oswego canals four and one-half miles..... 963	" "
For North Side cut leaks, lockages, etc. 800	" "
" Oswego canal lockages, lock eleven feet lift, four lockages per hour... 1,490	" "
Leakages and flushing boats..... 1,400	" "
Total..... <u>5,903</u>	" "

Leaving for pumping salt water by the State, and for Haskins & Barker, 8,962 cubic feet per minute, which I am confident is more than is necessary. From this statement it will be seen, that the Syracuse level will not, when the maximum trade of the canal is reached, make any demand upon the Rome level for water, unless more is used for power to drive machinery than there is now.

RECAPITULATION OF THE DEMANDS.

For evaporation and filtration	17,460	cubic ft. per minute.		
" lockages	14,200	" "		
" leaks at locks.....	1,440	" "		
" Flushing boats	1,800	" "		
" weigh locks	2,000	" "		
" Oneida lake canal	1,612	" "		
" extra proposed depth for the Rome level, fifteen cubic feet per mile per minute, $55\frac{7}{8}$ miles.....	835	" "		
Total demands for water.....	<u>39,427</u>	" "		

SOURCES OF SUPPLY.

The quantities supplied by the improved sources are taken from the last report of the State Engineer, excepting that of the Mohawk feeder at Rome, and are as follows:

The Ilion feeder	800	cubic ft. per minute.		
" Chenango canal	911	" "		
" Butts creek feeder	1,400	" "		
" Mohawk feeder, at Rome*.....	8,500	" "		
" Black river canal, at Rome.....	1,294	" "		
Wood creek†.....	125	" "		
" Oneida creek feeder.....	1,500	" "		
" Cowasselon feeder	320	" "		
" Erieville reservoir.....	2,131	" "		
" Chittenango feeder.....	250	" "		
" Cazenovia lake	2,631	" "		
" De Ruyter reservoir.....	3,972	" "		
" Limestone creek feeder	210	" "		
" Orville feeder (on Butternut creek)	450	" "		
The total present supply is	<u>24,494</u>	" "		

leaving a deficiency of 14,933 cubic feet per minute, to be supplied from unimproved sources.

This is not all needed at the present time; an additional supply of 6,000 to 7,000 cubic feet per minute, will suffice for several years to come, especially if the bottom of the Rome level is sunk one foot, making eight instead of seven depth of water; and the Black river reservoirs are kept in good repair.

* The amount given in the report of the State Engineer, is 11,766, being 3,266 cubic feet per minute more than I found flowing into the canal on the 26th July last, when the water in the river was twenty inches below the top of the dam and only two and one-half inches above the fixed top water line of the Rome level.

† This quantity is omitted in the report of the State Engineer.

Surveys have been made of Oriskany creek feeder ; for raising De Ruyter reservoir ten feet ; for two reservoirs on Canada creek, a few miles north of Rome ; for two reservoirs on Butternut creek, near Jamesville ; for a very large reservoir on Onondaga creek at Cardiff, ten miles south of Syracuse ; for turning the waters of the east branch of Fish creek into Canada creek, and thence into Wood creek, discharging the water into the Rome level at Rome, where the canal takes in Wood creek ; for turning the same waters from a point higher up the creek into a confluent of the west branch of the Mohawk river and discharging the water into the Rome level through the present Mohawk feeder at Rome.

In addition to these unimproved sources, surveys were made several years ago for three reservoirs, two on Oneida creek and one on Cowasselon creek, which are described in the report of the State Engineer for the year 1863.

Estimates in detail and descriptions of the several works above mentioned are annexed.

The following table gives a summary of the estimated cost and capacity of each work :

NAME.	Cubic feet supplied per minute.	Number of days supplied.	Estimated cost of construction.
Oriskany feeder.....	4,500	Through the season.....	\$11,500 00
De Ruyter reservoir, raised ten feet*	2,081	100	26,841 00
Butternut Creek reservoir, No. 1	1,989	60	34,000 00
Butternut Creek reservoir, No. 2	3,360	60	168,000 00
Canada Creek reservoir, No. 1	1,200	60	65,000 00
Canada Creek reservoir, No. 2	1,300	100	90,000 00
Cardiff reservoir	11,350	200	259,386 00
East branch Fish creek, No. 1	6,200	Through the season	118,179 00
East Branch Fish creek, No. 2	5,000	Through the season	179,443 00
Pine Bush reservoir.....	1,479	60	56,659 00
Oneida Creek reservoir.....	1,525	60	81,234 00
Cowasselon reservoir.....	2,040	60	104,563 00
Totals.....	.....	.....	.....

For a present supply, the least expensive works are Oriskany Creek feeder and De Ruyter reservoir. These will give 6,581 cubic feet per minute, at a cost of \$38,341, for construction. The incidental damages, it is believed, will not exceed the following :

For the Oriskany feeder..... \$85,000
 " Raising De Ruyter..... 10,000
 making a total, for construction and damages, of \$133,341. Besides

* See paper C. for rain statistics and other matters.

the small cost, there are other advantages connected with these works, to wit.: The Oriskany feeder can be constructed and brought into use in sixty days, being less than one-half mile from the canal; the De Ruyter reservoir is under perfect control of the watchman in charge of it. Being supplied from the surplus waters of the Tioughnioughga, a distinct valley from that in which it is located, and connected by an artificial feeder, which can in a moment be cut off, there can never be any danger of a flood rising above the dam and forcing a breach.

The next most feasible work for supplying the present wants of the Rome level, are Cowasselon, Butternut creek No. 1, in connection with the raising of De Ruyter reservoir. These will cost for construction \$165,000 and the incidental damages will not exceed \$70,000, making a total for these three works of \$235,400. They will yield 6,110 cubic feet per minute. If it were not for the high value put upon the waters of Fish creek by the mill owners, the cheapest water that can be had is the east branch of Fish creek turned into the Mohawk river or into Canada and Wood creeks. The incidental damages other than for water (which I have been told was reserved to the State in the original conveyances), will be almost nothing. And if the Canada creek route is adopted, an immense reservoir can be built by increasing the height of the dam for the proposed reservoir No. 2, which would yield over 4,000 cubic feet per minute, for one hundred days, in addition to the natural flow of all these creeks. One great advantage of this plan, is that there is no water lost by filtration; but, on the contrary, the volume is increased by the copious springs abounding all along the beds of these creeks.

In addition to all the above named unimproved sources, whence water may be supplied to the Rome level, is the projected Fish Creek feeder, by which it was proposed to turn the waters of both the west and east branches of Fish creek into the Rome level by an artificial channel eleven miles long, entering the canal at Fort Bull, some four miles west of Rome. It is said that both branches of Fish creek can furnish over 13,000 cubic feet per minute; but it is proposed to take only 7,500 and the estimated cost for construction alone is over \$683,000. The unfavorable nature of the country to be traversed by this feeder and the high value set upon the waters, together with the very large cost for construction, it is believed, will prevent the adoption of this project until after the construction of most, if not all, the works named in the above table.

The attention of the board is particularly called to the above table and to the descriptions and estimates annexed. Other combinations of the works mentioned may be, in view of the Board, more favorable for present use, than those particularized above.

Very respectfully submitted.

C. A. OLMSTED,

Civil Engineer.

SYRACUSE, December 31, 1870.

Estimated cost of Oriskany feeder, east side of creek, forty-six chains long.

QUANTITIES AND DESCRIPTION.	Amount.	Total.
15,000 cubic yards excavation, at 25 cents.....	\$3,750 00	
46 chains clearing and grubbing.....	92 00	
46 chains mucking and puddle ditches.....	138 00	
1,000 cubic yards lining, at 30 cents	300 00	
		\$4,280 00
125 cubic yards vertical wall, dry, at \$4.....	\$500 00	
94 cubic yards slope wall, at \$3.60.....	339 00	
		829 00
7,100 feet, B. M., hemlock in bridges, at \$20.....	\$142 00	
223 feet, B. M., pine in bridges, at \$60.....	16 10	
144 feet, B. M., oak in bridges, at \$45.....	6 48	
		164 58
60 cubic yards excavation for west abutment of dam	\$18 00	
45 cubic yards excavation for mud sills, at 50 cents.....	22 50	
560 cubic yards excavation for sheet piling, at \$1.....	560 00	
180 cubic yards excavation for apron, at 50 cents.....	90 00	
60 cubic yards excavation for foundation, at 50 cents.....	30 00	
56 cubic yards excavation for sheet piling under, \$1.....	56 00	
		776 50
219 cubic yards of masonry for abutments and bulk-head.....	\$2,190 00	
		2,190 00
40,000 feet, B. M., white oak, in dam, at \$40.....	\$1,600 00	
1,500 feet, B. M., pine in dam, at \$45.....	67 50	
65,000 feet, B. M., hemlock in dam, \$30.....	1,300 00	
		2,967 50
Add for contingencies		\$11,207 58
Total		\$292 42
		\$11,500 00

There will be about ten acres of land flowed by the dam, and about five acres covered by the feeder. Three-fourteenths ($\frac{3}{14}$) of the water power above the dam will be cut off permanently, and the whole of the power of the mills below the dam, will be taken away during dry seasons, when the canal needs all the water.

The estimate is based upon a feeder with a prism thirteen feet on bottom, five feet depth of water. Slopes $1\frac{1}{2} : 1$.

Estimated cost of raising De Ruyter Reservoir ten feet.

QUANTITIES AND DESCRIPTION.	Rate.	Amount.
975 cubic yards excavation, waste-weir	\$0 30	\$292 50
6,844 cubic yards excavation for terraces	15	1,026 00
47,473 cubic yards embankment in raising dam.....	26	12,243 98
6,600 cubic yards puddling.....	30	1,860 00
1,560 cubic yards slope-wall.....	1 50	2,340 00
704 cubic yards lining.....	30	911 20
1,355 cubic yards gravel on top dam	25	338 75
18,028 square yards turfing on north slope.....	10	1,802 80
18 cubic yards one-eighth inch joint masonry in weir wall.....	15 00	195 00
165 cubic yards one-fourth inch joint masonry.....	10 00	1,650 00
25 cubic yards coping on same.....	15 00	375 00
157 cubic yards vertical wall, dry.....	5 00	785 00
152 chains of highway to move.....	20 00	3,040 00
Total .....	.....	\$26,801 00

The plan for raising the dam is, to make it eighteen feet wide on top, to locate the inner slope of the bank on the line of the inner slope of the present bank produced and to give the outer slope an inclination of $2\frac{1}{2}:1$. This will give sufficient strength, and the outer slope of the new dam will fall within the base of the present dam. The discharge pipes and everything connected with them, will not need to be disturbed.

They are large enough to discharge the additional quantity of water.
(See paper C.)

Land covered by raising De Ruyter Reservoir ten feet.

Names of Owners.	Acres covered.
M. W. Coon	7.04
L. I. Sargeant	3.05
C. H. Maxon	5.09
Perry Greenman	0.35
Hervey Marble	4.13
Charles Wicks	2.87
Newell Reeves	4.79
William Wall	18.35
Crandall Clark	0.50
Albert Burdick	11.27
Benj. Merchant	22.95
Calvin House	8.24
Elizer Sweetland	6.45
J. De Graffe	1.35
State of New York	1.37
Burton Reed	3.80
Asa Ackley	2.22
Pat. Heffernan	0.98
	104.80
Present area	626.28
Total after raising ten feet.....	731.08

C.

The valley drained by De Ruyter reservoir is estimated to contain 12,000 acres.

From the patent office agricultural reports, and through the politeness of Dr. Stillman Spooner, of Oneida, Madison Co., I am enabled to make the following table, showing the depth of rain and melted snow for the years and months mentioned :

MONTHS.	1863.	1864.	1865.	1866.	1867.	1868.	Aver- age.	Available per acre after deducting 70 per cent for evapo- ration and filtra- tion.
January.....	3.43	.....	3.86	1.80	2.65	4.45	8.14	8,417 cubic ft.
February.....	2.25	.....	3.80	5.26	1.00	3.18	3.16	3,441 "
March.....	3.70	.....	2.80	2.97	2.83	4.80	3.42	3,724 "
April.....	3.37	.....	6.26	1.72	7.39	3.99	4.55	4,955 "
May.....	.....	.....	5.40	4.37	12.61	10.05	8.05	8,787 "
June.....	3.18	2.08	5.58	11.67	7.43	6.88	6.18	6,676 "
July.....	8.88	.....	6.21	5.78	5.96	5.97	6.56	7,144 "
August.....	12.73	12.53	1.58	7.80	5.15	6.60	7.78	8,418 "
September.....	.....	.....	9.16	9.08	5.67	10.70	8.65	9,490 "
October.....	.....	7.11	7.84	3.08	5.24	2.47	5.15	5,608 "
November.....	.....	4.16	6.23	7.61	2.88	10.64	6.54	7,078 "
December.....	.....	.....	3.72	3.70	3.74	5.57	4.18	4,553 "
Available to fill reservoirs for each acre per year.....								73,230 "
12,000 times this equals.....								873,640,000 "
De Ruyter reservoir will hold.....								793,648,048 "
Excess of waterfall per year.....								78,991,952 "

As the bottom of the feeder leading from the Tioughniogha river to the reservoir now is, not more than *one-third* of the water in that stream can get into the reservoir.

The estimated cost of raising the reservoir, includes, therefore, the cost of taking out the bottom of the feeder, at least two feet, down to the first *overfall* below the bulk-head. This overfall should be one foot lower than it now is.

In the second or third reach between the overfalls, are two large boulders lying on the bottom, one near the left and the other near the right bank. The banks are somewhat abraided in consequence of these stones ; if the material were less heavy there would have been large excavations there.

The bulk-head to this feeder needs repairing immediately ; the cap timbers are rotten ; the rack is broken ; one of the gate stems is entirely torn from the gate, and one of the screws will not operate to raise its gate. It is said by Mr. Maxson, the superintendent of the reservoir, and by all his neighbors, that there is no doubt about filling a reservoir more than twice as large as the present one ; still.

there may be seasons when it will not get completely filled between the droughts.

Estimate for Butternut Creek reservoir No. 1, located one-half mile south of Jamesville.

QUANTITIES AND ITEMS.	Price.	Amount.
Total balling and draining.....		\$500 00
Total grubbing and clearing.....		100 00
Total chopping and clearing.....		400 00
2,400 cubic yards excavation.....	\$0 16	384 00
72,000 cubic yards embankment.....	.26	18,720 00
12,000 cubic yards padding.....	10	1,200 00
155 cubic yards masonry in waste-weir, one-fourth joint.....	10 00	1,550 00
10 cubic yards masonry in waste-weir, one-eighth joint.....	20 00	200 00
75 cubic yards rubble masonry in cement.....	5 00	375 00
2,000 feet, B. M., hemlock, road bridge.....	20 00	40 00
80 feet, B. M., pine, road bridge.....	50 00	4 30
Spikes and nails, road bridge.....		5 00
225 cubic yards excavation in pit for pipes.....	.50	112 50
300 cubic yards excavation in pit rock.....	1 50	300 00
300 cubic yards cement masonry around pipes one-fourth joint.....	10 00	3,000 00
45 tons discharge pipes.....	90 00	4,050 00
1,600 pounds wrought iron bolts for pipes.....	15	240 00
150 pounds wrought iron shafting.....	12 1/4	18 75
450 pounds cast-iron gears.....	8	36 00
200 pounds wrought iron gates.....	10	20 00
Extra machine work on stop gates.....		100 00
.26 cubic yards masonry in well-house.....	10 00	260 00
.224 square feet tin roofing for well-house.....	15	33 60
600 feet, B. M., pine for roof.....	50 00	30 00
.28 cubic yards vertical wall, dry, race for well.....	4 00	92 00
.125 cubic yards paving, race for well.....	2 00	250 00
.27 cubic yards coarse gravel lining.....	40	10 80
.228 cubic yards excavation in outlet of waste-weir.....	20	44 60
.75 cubic yards vertical wall in outlet.....	4 00	300 00
2,000 feet, B. M., pine in rack.....	50 00	100 00
Spikes and bolts in rack.....		3 00
150 rods of road constructed.....	10 00	1,500 00
Total		\$38,979 55

This reservoir will supply 1,193 cubic feet per minute for 100 days, or 1,989 cubic feet per minute for sixty days.

Estimated cost of Butternut Creek Reservoir No. 2.

QUANTITIES AND ITEMS.	Price.	Total.
1 balling and draining.....	\$30 00	\$300 00
35 acres chopping and clearing.....	80 00	1,050 00
1 grubbing and clearing.....	25 00	250 00
484,000 cubic yards embankment.	26	125,840 00
4,850 cubic yards excavation, mucking and puddle ditch.....	20	970 00
38,000 cubic yards puddling.....	15	4,850 00
1,250 cubic yards excavation in pit for pipes.....	30	375 00
370 cubic yards cement masonry one-fourth joint.....	10 00	3,700 00
1,000 cubic yards excavation in waste-weir pit (rock).....	1 25	1,250 00
750 cubic yards excavation in waste-weir pit (earth).....	20	150 00
180 cubic yards cement masonry, one-fourth joint, in waste-weir.....	10 00	1,800 00
10 cubic yards cement masonry, one-eighth joint, in waste-weir.....	20 00	200 00
75 cubic yards rubble masonry in cement, foundation.....	5 00	375 00
75 cubic yards vertical wall, dry.....	4 00	300 00
125 cubic yards paving.....	2 00	250 00
1 road bridge over outlet.....		50 00
75 tons discharge pipes.....	90 00	6,750 00
4,000 pounds wrought iron bolts.....	15	600 00
8 stop gates.....	200 00	600 00
38 cubic yards masonry in well.....	10 00	380 00
224 square feet tin roofing.....	15	33 50
600 feet, B.M., pine for roof.....	50 00	30 00
50 cubic yards dry vertical wall in race from well.....	4 00	200 00
300 cubic yards excavation in race from well.....	20	60 00
1 rack in front of pipes.....		150 00
8 packings for pipe.....	175 00	525 00
290 rods road constructed.....		2,900 00
Total		\$153,718 00
If the road is located over the dam the following items are to be added, viz:		
1,600 cubic yards gravel lining.....	30	480 00
900 cubic yards slope wall.....	1 25	1,125 00
2,600 cubic yards embankment.....	26	676 00
		\$2,281 00
Total		\$155,999 00

This reservoir contains over 177 acres, and will be $37\frac{1}{16}$ feet average depth. The drainage basin is 40,000 acres including that of No. 1 reservoir. This reservoir will furnish 2,015 cubic feet per minute for 100 days, and 3,360 for sixty days.

Estimated cost of Canada Creek Reservoir No. 1.

QUANTITIES AND DESCRIPTION.	Amount.	Total.
1,728 cubic yards excavation, mucking and puddle ditching, 12½ cents.....	\$916 00	
245,274 cubic yards embankment, at 22 cents.....	53,960 28	
12,950 cubic yards puddling, at 25 cents.....	3,238 12	\$57,414 40
70,000 pounds cast-iron pipes, eighteen inches in diameter inside, three-fourths of an inch thick, flanges for twenty-five lengths, of nine feet each, included in this weight, at 7 cents.....	\$4,900 00	
1,200 pounds cast-iron in two plates, four by four feet, where the puddle wall crosses the pipe, at 7 cents.....	84 00	4,984 00
100 cubic yards masonry around discharge pipes, at \$6.....	\$600 00	
180 cubic yards in waste-weir, at \$6.....	1,080 00	1,680 00
Add for contingencies.....		\$64,078 00
Total		\$85,000 00

This reservoir can be filled twice, so as to be available during the dry season. This will give it a capacity equal to 1,200 cubic feet per minute for sixty days.

Its area is sixty-three acres, and average depth twenty feet. Drainage basin 9,000 acres. You may empty it in July, fill it in August, and again empty it in September. The dam is located about one mile below Lee Center.

Estimated cost of Canada Creek Reservoir No. 2.

QUANTITIES AND DESCRIPTION.	Amount.	Total.
22,980 cubic yards excavation, mucking and puddle ditch, at 12½ cents.....	\$2,907 00	
300,000 cubic yards embankment, at 22 cents.....	66,000 00	
55,500 cubic yards, puddling at 25 cents.....	13,875 00	
		\$82,782 00
34,500 pounds cast-iron pipe, eighteen inches inside diameter, three-fourths of an inch thick, flanges for twenty-five lengths, of nine feet each, included in this weight, at 7 cents.....	\$2,475 00	
1,200 pounds in two plates, four by four feet, where the puddle wall crosses the pipe, at 7 cents.....	84 00	
		2,559 00
100 cubic yards masonry around discharge pipe, at \$6.....	\$600 00	
180 cubic yards in waste-weir, at \$6.....	1,080 00	
		1,680 00
Total		\$87,021 00
Add for contingencies and additional pipe.....		2,979 00
Total		\$90,000 00

This reservoir contains 360 acres, and will average twelve feet in depth, and will yield 1,300 cubic feet per minute for 100 days. If the east branch of Fish creek is conveyed through it to the canal, it can be raised twenty-five feet higher, and will probably cover about 100 acres more, and will yield 4,500 cubic feet per minute for 100 days, instead of 1,300 cubic feet. The drainage basin, 12,000 acres, including the drainage of the No. 1 reservoir. The dam is located about one mile below the dam of No. 1.

CARDIFF RESERVOIR.

We have made a survey for a reservoir in the Onondaga valley, about ten miles from Syracuse, directly opposite to the village of Cardiff. This reservoir will contain 2,128 acres, with an average depth of water of thirty-five feet. It will contain 3,268,900,000 cubic feet of water, and will supply 11,350 cubic feet per minute for 200 days. The dam is located on or near the south line of the Indian reservation, at a point known as the "Narrows;" it is to be 113 feet high, and will be about 700 feet long and eighteen feet wide on the top with slopes 3½:1 on the inside, and 2:1 on the outside.

The water is to flow through the natural bed of the creek, $3\frac{2}{5}$ miles, where a dam is to be erected to turn the water into a feeder, which is to convey the water into the Rome level about 400 feet above lock 47, known as the "Upper Lodi Lock."

The "water shed" for this reservoir is estimated at 55,000 acres, which will afford, according to the rain table before mentioned, 4,027,100,000 cubic feet of water yearly.

The estimated cost of the reservoir and feeder is as follows, viz.:

Estimated cost of the Cardiff Reservoir, Onondaga creek.

QUANTITIES AND ITEMS.	Price.	Amount.	Total.
Bailing and draining.....		\$1,000 00	
Grabbing and clearing.....		300 00	
35 acres chopping and clearing.....	\$50 00	1,250 00	
7,500 cubic yards excavation, mucking and puddle ditch.....	16	1,200 00	
2,400 cubic yards excavation in pit for pipes.....	30	720 00	
500,000 cubic yards embankment.....	26	135,200 00	
2,800 cubic yards excavation for waste-weir.....	25	700 00	
1,020 cubic yards masonry around pipes, one-fourth inch joint.....	10 00	16,200 00	
200 cubic yards masonry in waste-weir, one-fourth inch joint.....	10 00	2,000 00	
15 cubic yards masonry in waste-weir, one-eighth inch joint.....	20 00	300 00	
900 cubic yards rubble masonry in cement.....	5 00	4,500 00	
600 cubic yards paving.....	2 00	1,200 00	
Road bridge over waste-weir.....	250 00		
334 tons cast-iron discharge pipes.....	80 00	25,920 00	
12,000 pounds wrought iron, for pipes.....	12½	1,500 00	
6 stop cocks.....	300 00	1,800 00	
Well house.....		900 00	
600 cubic yards gravel lining.....	40	240 00	
Racks before pipes.....		200 00	
480 Rods road constructed.....	10 00	4,800 00	
35,000 cubic yards puddling.....	10	3,500 00	
			\$203,680 00
FEEDER FROM THE RESERVOIR.			
<i>Dam.</i>			
80 cubic yards excavation in foundation.....	2 00	\$160 00	
16,000 feet, B. M., hemlock timber and plank.....	25 00	400 00	
58 cubic yards cement masonry.....	20 00	1,160 00	
90 cubic yards masonry in abutments.....	10 00	900 00	
3,300 feet, B. M., white oak timber for bulk-head.....	50 00	165 45	
130 cubic yards cement masonry, one-fourth joint.....	10 00	1,300 00	
			4,085 45
<i>Feeder.</i>			
96,000 cubic yards excavation in prism.....	20	\$19,200 00	
44,000 cubic yards embankment.....	25	11,000 00	
27,000 cubic yards mucking.....	15	4,050 00	
10 road bridges.....	500 00	5,000 00	
			39,250 00
Total.....			\$43,335 45
Total for feeder and reservoir.....			\$247,015 45
Add five per cent for contingencies			12,350 77
Total.....			\$259,366 22

No. 1.

Estimated cost of turning the waters of the east branch of Fish creek into the Erie canal, through the beds of West, Canada and Wood creeks.

QUANTITIES AND DESCRIPTION.	Amount.	Total.
Preparing foundation for the dam, 200 feet long, at 50 cents.....	\$100 00	
7,778 cubic yards rubble stone masonry at \$5.....	38,890 00	
55 cubic yards grey lime stone coping at \$10.....	550 00	
		\$39,540 00
176 cubic yards masonry at bulk-head at \$6.....	\$1,056 00	
Gates and fixtures for bulk-head.....	244 00	
		1,300 00
70,000 cubic yards excavation in deep cut, fifty-seven chains long, at 60 cents.....	\$42,000 00	
53,000 cubic yards excavation for channel for five miles, reaching to the first reservoir, at 15 cents.....	7,950 00	
15,200 cubic yards in the cut from the lower reservoir to Wood creek at 20 cents.....	3,040 00	
43,000 cubic yards excavation for 4 13-100 miles on Wood creek at 15 cents..	6,450 00	
		59,440 00
270 cubic yards of masonry for six bridges at \$7.....	\$1,890 00	
18,000 feet, E. M., timber and plank for bridges at \$40.....	720 00	
		2,610 00
Add ten per cent for contingencies		\$102,890 00
		10,289 00
Total.....		\$113,179 00

This expenditure will deliver 6,200 cubic feet per minute to the Rome level, being 5,000 from the east branch of Fish creek, and 1,200 from the Canada creek.

The whole distance from the east branch of Fish creek to the canal by the beds of the creeks, is $12\frac{8}{9}$ miles.

For the first two miles from the canal up Wood creek, no excavation is required.

The land damages on this line will be very light.

It is proposed to build a dam fifty feet high, 200 feet long, thirty-seven feet thick on the bottom and five feet on top. A cut fifty-seven chains in length, averaging fourteen deep, will discharge the water at the head of West creek, the bed of which it will traverse about two miles; thence it will be diverted into Beaver Meadow creek, which empties into Canada creek at Lee Center, about one-fourth of a mile above reservoir No. 1; thence it will pass through the reservoirs Nos. 1 and 2 into a cut to be made between Canada and Wood creeks. This cut is fifty chains long, containing 15,250 cubic yards of excavation; thence passing over the bed of Wood creek the water is discharged into the canal at Roine, where that creek is taken into the canal.

No. 2.

TURNING THE WATERS OF EAST BRANCH OF FISH CREEK AND POINT ROCK CREEK INTO THE VALLEY OF THE MOHAWK.

About a half a mile above Ferguson's saw-mill, is a comparatively low place on the east bank of the east branch of Fish creek. From this point a level has been run over the valley of the Point Rock creek, to the head waters of a confluent of the west branch of the Mohawk. The distance leveled is just two miles. By the profile hereto annexed it will be seen that the swamp at the head of the Mohawk valley is forty feet above the bed of Fish creek, and that the valley of Point Rock creek is nearly as deep as the Fish creek channel, and will require a dam of earth twenty-seven chains long and fifty feet high.

It is proposed to erect a dam forty-eight feet high across Fish creek, and make a cut about fifty-four chains long, averaging about sixteen feet deep. The material in the cut is sand, and will need protecting by slope walls. We have made the calculations for a cut eighteen feet bottom with slopes 1 : 1. The following is the estimated cost of the work :

QUANTITIES AND ITEMS.	Price.	Total.
7,111 cubic yards cement stone masonry in dam.....	\$5 50	\$39,110 00
296 cubic yards cement stone masonry in abutments.....	6 00	1,776 00
738 cubic yards cement stone masonry, wings to abutments.....	6 00	4,410 00
Preparing foundation for dam		300 00
60,000 cubic yards embankment, both ends of dam.....	.25	15,000 00
200 cubic yards masonry in bulk-head.....	6 00	1,200 00
55 cubic yards grey lime coping on dam.....	10 00	550 00
Gates and fixtures for bulk-head.....		244 00
90 cubic yards masonry for two road bridges.....	7 00	630 00
6,000 feet, B. M., timber and planks for road bridges.....	40 00	240 00
77,000 cubic yards excavation in cuts.....	30	23,100 00
288,000 cubic yards embankment across Point Rock valley.....	28	66,990 00
11,000 cubic yards puddling.....	10	1,100 00
9,000 cubic yards mucking, etc.....	20	1,800 00
4,500 cubic yards slope wall.....	1 50	6,750 00
Add for contingencies.....		\$163,180 00
		16,313 00
		\$179,443 00

It is possible, perhaps, to turn these waters into the Mohawk with a less expenditure by locating the dam higher up the creek. Our time was limited, and we cannot speak definitely on this subject without further explorations. In any point of view I do not deem this so favorable a project as turning the waters into Canada creek.

Estimated cost of constructing Cowasselon reservoir.

QUANTITIES.	Price.	Total.
1 bailling and draining.....	\$20 00	\$20 00
90 acres chopping and clearing	100 00	1,800 00
3 acres grubbing and clearing	22	300 00
22,000 cubic yards excavation.....	26	4,840 00
26,000 cubic yards embankment.....	26	61,880 00
26,000 cubic yards puddling.....	15	3,900 00
8,000 cubic yards lining.....	30	900 00
130 cubic yards cement masonry, one-eighth joint.....	16 00	2,080 00
500 cubic yards cement masonry, one-fourth joint.....	10 00	5,000 00
1,100 cubic yards cement rubble masonry.....	5 00	5,500 00
300 cubic yards dry wall.....	3 50	1,050 00
50 cubic yards coping.....	16 00	800 00
900 cubic yards quarry stone pavement.....	3 00	900 00
10,000 cubic yards gravel lining (in lieu of rip-rap).....	50	5,000 00
400 cubic yards loose stone and brush.....	1 50	600 00
6,000 feet, B. M., white oak timber.....	50 00	300 00
3,000 feet, B. M., white pine timber.....	50 00	150 00
28,000 feet, B. M., hemlock timber.....	18 00	504 00
8,000 lineal feet bearing piles.....	25	2,000 00
3,000 pounds wrought iron.....	12	360 00
1,200 pounds cast-iron.....	.07	84 00
3,000 pounds lead.....	10	300 00
1,000 pounds spikes and nails.....	.07	70 00
40 tons discharge pipes.....	90 00	3,600 00
2 stop cocks.....	200 00	400 00
800 square feet tin roofing.....	15	45 00
1,900 square yards turfing	10	1,900 00
Total .....	.....	\$104,568 00

This reservoir has an area of 136 acres, a depth of 21.1 feet, and will furnish for sixty days 1,446 cubic feet per minute; for 100 days, 888 cubic feet per minute.

Natural flow over and above that estimated by the State Engineer, 594, making a supply of 2,040 cubic feet per minute for sixty days.

A.

It is computed that a canal one mile long and ten feet wide loses, by evaporation, one cubic foot of water every minute. The nominal width of our canal is seventy feet surface, but in fact it is much wider. There are a great many wide places where the line was changed by the enlargement, and there are many basins where the water is over 100 feet wide. It is not, therefore, deemed unreasonable to assume eighty feet as the surface width for these seventy-nine miles. This gives for evaporation eight cubic feet per mile per minute. I notice in the reports, that it is usually assumed that the old canal, forty feet wide, lost by evaporation and filtration, eighty-five cubic feet per mile per minute. This is a fair allowance; some of the older engineers thought 100 cubic feet per mile per minute was safer; but let us adopt the eighty-five and separate the evaporation, and we have eighty-one as the quantity lost by the old canal by filtration. Now our canal is twice as wide

as the old canal, and if it were only four feet deep, it would filtrate just twice as much water, viz.: 162 cubic feet per minute; but our canal is seven feet deep, hence, the filtration will be as $\sqrt{4} : \sqrt{7} :: 162 : 214$ cubic feet per mile per minute for filtration; add evaporation and we have 222 cubic feet per mile per minute for evaporation and filtration.

D.

The special committee of the Legislature say, that 33,602 cubic feet of water per minute is used for pumping salt water. I have taken a little trouble to ascertain if this is correct. I find, in this office, a record of measurements made by Mr. Jerome, a civil engineer formerly employed on this division. He makes the quantity drawn from the canal to drive the pumps as follows, viz.:

Geddes.....	375	cubic feet per minute.		
Syracuse	1,150	"	"	
Salina.....	800	"	"	
 Making a total of.....	2,325	"	"	used.
Instead of the.....	33,602	"	"	
 <hr/>				

I called on Geo. Geddes, Esq., superintendent of salt springs, for some information respecting the distance the salt water is elevated, and the kind and size of the water wheels used, etc., and while I was getting this, he voluntarily produced a requisition he had made by the advice of Mr. Van Vleck, a civil engineer, calling for 6,000 cubic feet per minute to drive the salt water pumps. This is nearly three times as much as Mr. Jerome made it, and five and one-half times *less* than the special committee made it.

I have made some calculations from the data obtained of Mr. Geddes, to show how much water it *should* take, with properly arranged machinery, to elevate the salt water used in the manufacture of all the salt produced in the four districts named in his report for 1869.

There are 2,000,000 gallons raised daily at Syracuse eighty-four feet.

993,700 gallons raised daily at Salina seventy-one feet.

390,000 gallons raised daily at Geddes fifty-one feet.

$2,000,000 \times 84 = 168,000,000$ gallons raised one foot per day.

$993,000 \times 71 = 70,552,000$ gallons raised one foot per day.

$390,000 \times 51 = 19,890,000$ gallons raised one foot per day.

Making a total of 258,442,000 gallons raised one foot per day.

Reducing this to cubic feet we have $\frac{258,442,000}{7.48} = 34,551,070$ cubic feet

raised one foot per day. This is equal to 23,994 cubic feet raised one foot per minute.

Reducing this to fresh water [Mr. G. says that twenty-seven feet of salt water equal thirty-three feet of fresh] we have 29,321 cubic feet of fresh water raised one foot per minute. Add fifty per cent for friction and waste and we shall have 43,981 cubic feet raised one foot per minute. Now divide this by the fall of the water used to do the pumping and we shall have the quantity required. The wheels are twenty feet in diameter, and Mr. G. said the head was five to six feet. This is too great to be useful, and we will take it at what it ought to be, viz.: three feet, that will give $\frac{43,981}{28} = 1,912$ cubic feet per minute as sufficient for pumping the water as the machinery is now arranged. If the wheels were placed so as to make use of the whole fall ($28\frac{5}{16}$ feet) still less water would answer.

Mr. Jerome's measurements are no doubt correct, and the special committee made a serious blunder.

IMPROVEMENT IN THE ROME LEVEL.

This level was originally constructed on a perfectly horizontal plan; both ends were equal in altitude. When the Mohawk feeder was introduced, its large quantity of water, in order to flow both ways in the prism of the canal, necessarily raised the water surface at its confluence with the canal.

If this feeder had been midway between locks 46 and 47, and no other feeder were discharging into the canal, it is clear that the flow of water would have been equal each way.* But this not being the fact and distances on either side of the feeder being unequal, the flow of the water is unequal, and besides this, the water that flows into the canal at Chittenango, Limestone, and Orville tends to increase the unequal flow from the Rome feeder, so that almost all the water from that feeder flows eastward and, by continually flowing over at the weirs and aqueducts, has given to persons having charge of the canal, the idea that the level must be full everywhere because it was full at Oneida, Oriskany, and other points within fifteen miles east or west of Rome; and when seeing the water wasting at these places, they felt that it was unnecessary to keep open the gates of the feeders, and attributed the difficulty experienced to navigation to the filling up of the canal with sediment.

* The distance from the Mohawk feeder to lock 46, near Utica, is 18 65-100 miles, and to lock 47, at Syracuse, is forty-two miles; consequently the water flows with more than twice the velocity east than it does west,

The remedy for this difficulty, in my opinion, is to give the water a depth of eight feet at least (nine would be better), and the prism of the canal an inclination each way from Rome of $\frac{3}{100}$ of a foot per mile and raise and maintain the towing-path three feet above the top water line.

This being a summit level from which the canal each way is fed, there ought to be an allowance for a fluctuating depth; so that in seasons of drouth, the water can be drawn down low enough to take in *all* the waters of all the feeders and increase the inflow by increasing the fall. The waste-weirs and aqueducts should be made to correspond with this grade and ought to be one-tenth of a foot above top water line. This extra depth of water will form a most useful and opportune reservoir in dry seasons; although the first cost may be more than that of other reservoirs, its maintenance will be nothing; it is always on hand and just where you want it. If the canal fills up with sediment it must be taken out, and this extra depth can be maintained in the same manner and at no more expense.

THE BLACK RIVER AND OTHER FEEDERS.

Your instructions of the 17th of August, required a report on the "relative amounts of water supplied to the Rome level by the Black river (and other reservoirs connected therewith), the Mohawk and other sources (if any), carried through the same feeder."

Since that date I have not been able to make a personal examination of the feeders and reservoirs in the Black river region, and have therefore gleaned all the information hereinafter given from the reports of the Canal Commissioners and State Engineer.

It appears to have been the intention of the Commissioners to make a feeder of the Black river, both for the Black river and Erie canals; to discharge the water into Lansing kill immediately below lock No. 64; there was supposed to be sufficient to "supply the Black river canal, and the enlarged Erie canal east of Rome."

The mill owners began to prefer claims for damages for diverting the water soon after the feeder was put in operation; and surveys of five reservoirs were made with the view of returning to Black river 11,000 cubic feet per minute, said to be diverted by the feeder; and in 1849 the Legislature made an appropriation (by chap. 326, § 1) for the purpose of completing "so many of the Black river reservoirs as will, with the least expense, restore to the Black river 11,000

cubic feet of water per minute, being the quantity diverted to the Erie canal.

The following are the feeders and reservoirs to the Black river canal, viz. :

1st. *The Delta*, supplies the canal from Rome to lock No. 9, seven miles.

2d. *The Lansing kill*, supplies the canal from lock 9 to lock 34, ten miles.

3d. *Black river*, supplies the canal from lock 34 to lock 102, seventeen miles.

4th. *Pond above the dam at Lyon's Falls*, feeds the canal from lock 102 to lock 109, one and one-third miles. This lock discharges into the river.

None of the water from the above feeders reaches the Erie canal excepting the lockage and leakage water from the summit.

The three reservoirs, viz. :

North branch contains	310,000,000	cubic feet.
South branch "	421,190,000	" "
Woodhull "	876,550,000	" "

belong to the Erie canal.

Originally the Black river feeder was intended to give 5,000 cubic feet per minute to the Black river canal, and 11,000 cubic feet per minute to the Erie canal. The mill owners on Black river procured the appropriation above quoted, to construct these reservoirs to restore to them the use of the 11,000 cubic feet per minute aforesaid.

These reservoirs give for 100 days 11,165 cubic feet per minute, which ought to come via the Mohawk (see State Engineer's report for 1869, pp. 22 and 23) to the Erie canal at Rome.

On the 26th of July last, when the water was very low in the Mohawk, and twenty inches below the top of the dam, I measured the water flowing into the Rome level through the Mohawk feeder, and found it only 8,500 cubic feet per minute. All the reports, for several years past, quote the Mohawk feeder as furnishing 11,766 cubic feet of water per minute to the Rome level. How much of this does the Mohawk river furnish?

If the reservoirs give 11,000 cubic feet per minute, then the Mohawk supplies only 766 cubic feet per minute! The Black River canal gives the Rome level 1,294 cubic feet per minute; this is the lockage and leakage water that comes down from the summit.

The Lansing kill and Delta feeders are supposed only to supply the evaporation and filtration.

Is not the copartnership existing between the three parties, viz.: the mill owners, the Black River canal and the Erie canal, very unsatisfactory and precarious for the interest of the Erie canal?

Chub lake reservoir has been surveyed, and estimated to contain 387,167,000 cubic feet. It was once under contract, but was suspended and never resumed. If its water could be conveyed by some other channel, than that through which the 11,000 cubic feet per minute are supposed to flow, it could be reckoned upon as a contingent source for a further supply to the Erie canal.

It is said that the North Branch reservoir can be filled twice during the dry season. Here, then, is another additional source of supply for the Rome level, if it can be faithfully distributed, equal to 2,152 cubic feet per minute, and which can be enjoyed without further expense.

Respectfully submitted.

C. A. OLMSTED, C. E.

• P. S.—Since the above was written, I have been informed that the North Branch reservoir was not repaired, and has not afforded any water this season, and that the Woodhull reservoir has been drawn to the bottom. This accounts for the small amount found in the Mohawk, and the deficiency mentioned in the report may be reduced to 11,555 cubic feet per minute.

C. A. O.

D.

WATER REQUIRED BY THE ONEIDA LAKE CANAL.

The canal is $5\frac{9}{100}$ miles long, from the Erie canal to lock No. 6, which is at the lake. The prism is $47\frac{1}{2}$ feet bottom and seventy feet top. Locks Nos. 1 and 6 are each eleven feet lift, and are the same size as the locks of the Erie canal.

	Cubic feet.
Evaporation, seven cubic feet per mile.....	35.35
Filtration, $173\frac{1}{2}$ cubic feet per mile.....	876.18
Leakage at lock.....	390.00
The cubic contents of one lock of eleven feet lift is $22.335\frac{15}{100}$ cubic feet ; one leakage requires 15.51 cubic feet per minute.	
Twenty lockages both ways per day is probably more than will ever occur.....	310.00
	<hr/>
	1611.53
	<hr/>

It may be thought that no allowance should be made for lockages, as there is some doubt in the minds of practical men whether the business of the canals will be very much, if any, increased by the construction of this canal. It is believed that the lockages from the Rome level will not be increased by this canal.

WESTERN DIVISION.

CANAL COMMISSIONER'S OFFICE,
ROCHESTER, December 15, 1870. }

The Commissioner in charge of the Western Division of the canals presents the following report of said division for the fiscal year ending September 30, 1870 :

The canals embraced in this division are as follows :

Erie canal, from east line of Wayne county to Buffalo, including works connected therewith	149 miles.
Genesee Valley canal, from Rochester to Olean	107 miles.
Extension of said canal, from Olean to Millgrove	6 miles.
Dansville branch, from Shakers to Dansville.....	11 miles.
 Total.....	 273 miles.

There are also seventeen miles of feeders, three of which are navi-gable, and three reservoirs, to wit : Ischua, Oil Creek and Rockville.

ENGINEER DEPARTMENT.

This department has been under the joint charge of Daniel Richmond as Division, and J. Nelson Tubbs as Resident Engineer, and their assistants employed in the service. The duties of the department are of a twofold nature : one is to look after the repairs, navigation and management of the canals ; the other, to make surveys, maps, plans and estimates of all work ordered by the Legislature or Canal Board, and superintend the building thereof. There is now a large amount of the latter kind of work under contract and in progress on this division, necessarily requiring quite a large engineering force to supervise its construction.

The appropriations made from the ordinary repair fund to pay this branch of the service have of late been inadequate for that purpose, and the balance has been taken from the fund appropriated to extra-ordinary repairs. In order to equalize the charges as between these funds, a larger amount should be appropriated from the ordinary

repair fund for that purpose. The amount heretofore appropriated from ordinary repair fund to pay engineering has been eighteen thousand dollars per year, which gives to each division of the canals six thousand dollars. The appropriation should be at least thirty thousand dollars per year, which would allow for each division ten instead of six thousand dollars, as now.

SUPPLY OF WATER.

This division of the Erie canal is supplied with water from Lake Erie through Black Rock harbor, from Tonawanda creek at Pendleton, from Tonawanda and Oak Orchard creeks at Medina, from the Genesee Valley canal and Genesee river feeder at Rochester. The main supply is, however, obtained from Lake Erie, and which, together with the other sources mentioned, are deemed adequate for the purpose.

The Genesee Valley canal is supplied with water from the following sources: Allen's creek, at Scottsville; Genesee river, at Mount Morris; Canaseraga creek, at Woodville; Mill creek, at Dansville; Wiscoy creek, at Mixville; Genesee river feeder, at Oramel; Rockville reservoir, at Rockville; Oil creek reservoir, at Cadyville; Champlain and Griffith creeks, at Cuba; Ischua feeder, near south end of Summit; Oil creek feeder, near Hinsdale; Dodge and Has-call creeks, and the Allegany river, on the extension above Olean.

The present sources of supply are deemed ample for all parts of said canal, except the southern two miles of the Dansville branch, which has not at all times a sufficiency of water.

It is claimed, however, that this can be remedied by turning Loon Lake, distant from Dansville some ten miles, into the channel of Mill creek, and bring it thence into the canal by the present dam and feeder at the latter place.

A survey and estimate has recently been made by the engineers, showing the entire feasibility, and at moderate cost, of supplying such deficiency from that source.

APPOINTMENT OF SUPERINTENDENTS AND PATROLMEN, AND GENERAL CONDITION OF NAVIGATION.

Previous to March 23d, 1870, this division of the canals was subdivided into eight repair or superintendents' sections. At that time the Canal Board, by resolution, made a fourth section on the Genesee Valley canal by cutting off the southerly end of section 3, or

that portion of it lying in the county of Cattaraugus, which has since been known as section 4; and subsequently, on the 2d day of June, 1870, said board cut off that portion of section 2 lying south of the Mixville feeder, and added the same to section No. 3, so that now there are nine sections, five of which, to wit, Nos. 10, 11, 12, 13 and 14 are upon the Erie, and four, to wit, Nos. 1, 2, 3 and 4, upon the Genesee Valley canal.

The following are the names of the superintendents appointed by said Board, and the sections respectively assigned in charge to each:

William F. Ashley, section No. 10, Erie canal.

Matthew Rigney, section No. 11, Erie canal.

Lewis M. Loss, section No. 12, Erie canal.

William McRae, section No. 13, Erie canal.

Frank B. Gallagher, section No. 14, Erie canal.

John H. Jones, section No. 1, Genesee Valley canal.

James Lemen, section No. 2, Genesee Valley canal.

Wm. A. Kirkpatrick, section No. 3, Genesee Valley canal.

John L. Adams, section No. 4, Genesee Valley canal.

On the 1st of September last, James Mooney was appointed superintendent of section No. 14 of the Erie canal, in place of Frank B. Gallagher, deceased on the 17th of July previous.

The several superintendents are now in charge of the sections respectively assigned them at the time of their appointments.

The canals on this division were opened for navigation on the 10th day of May (except the Genesee Valley, which was not got in readiness until some ten days later), the time appointed, and closed by official notice of the Commissioners on the 8th of December instant, although some boats passed on parts of the division even up to the 14th inst., and without the least impediment by ice.

The levels have been kept at an uniformly even height, and navigation has been good and mainly uninterrupted during the entire season.

Round trips on the Genesee Valley canal have been made the last season in less time than during any season heretofore, and on the Erie in less time than for several years previous, eliciting from boatmen, who are the most competent judges, their approval of the fact of an unobstructed navigation and general good condition of the canals.

PATROLMEN.

Pursuant to act chapter 55, Laws of 1870, the Canal Board, on the 14th of June last, appointed twenty-four patrolmen on this division of the canals, to wit: five on section No. 10; seven on section No. 11; six on section No. 13; five on section No. 14, and one on section No. 3, Genesee Valley canal. On the 8th of December, 1870, said Board terminated the services of all the patrolmen, then in office, on the tenth of that month.

If faithful, practical canal men could in all cases be secured for such office, at locations where required, they would be desirable acquisitions to the service, and could, upon their respective beats, render much valuable aid to navigation, and protection against disasters likely to occur upon the canals.

REPEAL OF THE CONTRACT SYSTEM, ACT CHAP. 55, LAWS OF 1870.

The following are the first three sections of said law:

“ SECTION 1. All laws and parts of laws requiring the letting and keeping the canals in repair by contract are hereby repealed, and the contracting board is hereby abolished. But the repeal of the said laws shall not, except as otherwise provided by this act, invalidate the contracts heretofore made, or discharge any of the contractors from the duties and obligations imposed by such contracts or the said laws, and the right of the said contractors to receive from the State any pecuniary compensation or other relief under said contracts shall not be affected thereby.

“ § 2. It shall be lawful for any contractor for repairs of the canals, under a contract heretofore made, to surrender to the Canal Board his said contract; and the said Canal Board shall, upon such surrender, accept the same, and from the time of such surrender and acceptance thereof, the said contract shall be annulled, and the said contractor shall be discharged from all the obligations thereof.

“ § 3. It shall be lawful for the Canal Board upon the recommendation of the Canal Commissioners, whenever they shall deem it for the interests of the State, to cancel and annul any contract or contracts for repairs of the canals heretofore made, by a resolution to be entered in the minutes of the said Board, and upon the entry of such resolution, such contracts as shall be thereby declared canceled and annulled shall be annulled, and the contractors discharged from all obligations to perform the same thereafter.”

In pursuance of section 2 of said act, the contractors for repair sections Nos. 1 and 3 on the Genesee Valley canal, and for Nos. 12 and 13 on the Erie canal, surrendered their contracts for cancellation

on the 1st day of April last. The only repair contracts then and now remaining on this division are sections Nos. 10, 11 and 14 on the Erie canal.

Sections Nos. 10 and 11 expire by limitation in one year from the 1st of January, 1871, and section No. 14 in two years from that time.

It will be observed that section 1 of the act, in repealing the system and abolishing the contracting board, recognizes the validity of and the rights of the contractors under the then existing contracts. Section 2 allows any contractor to surrender to the Canal Board his said contract, and the Board *shall*, upon such surrender, accept the same. The Canal Board has no discretion in the matter, but must accept contracts so surrendered. Section 3 makes it lawful for the Canal Board, upon the recommendation of the Canal Commissioners, whenever *they shall deem it for the interest of the State*, to cancel and annul any such contract for repairs. The annulling of a contract by the Canal Board requires, as a condition precedent, the recommendation thereof by the Commissioners. The Commissioners should not so recommend unless they deem it for the interests of the State, nor should they hesitate now or at any future time to make such recommendation should they deem it the State's interest to do so. They are made the judges; and being familiar with and knowing all the circumstances connected with each section, should be sustained, and not censured, in the judicious exercise of a discretionary power conferred upon them by law, without regard to the whims or caprices of one or another set of men.

Before the repeal of the contract system the Commissioners had not the right, of their own volition, to abandon a repair contract, and were in a great measure powerless, having only the power to direct the superintendent to do work which the contractor failed or neglected to do, and deduct same from the amount of the contract. The superintendent was of course short of tools and materials in all such cases, and must make provision therefor by purchasing them before he could do the work, and then even, with the contract in force, could not go beyond the amount of same, although it might be entirely inadequate in price to do the work which ought to be done.

An examination of the matter will sustain the view of the case presented by the undersigned to the Canal Board on the 19th of March last:

"The performance of the several contractors under their respective contracts have differed in degree, dependent upon circumstances and

the amount of compensation received upon each ; and while it may, perhaps, be said that none of them have hitherto fully and faithfully in all things performed their contracts according to the letter thereof, so much has been done upon the several sections as that good navigation was secured and maintained, during the past two seasons, with but slight interruption from any cause ; and without saying that more might or should have been done, the fact is perhaps patent, that in the history of the canals there never has been two seasons of more successful navigation on this division of the Erie canal than the two last past.

"The condition of the several sections now are about the same as they were at the close of navigation in December last ; in fact there has been no time as yet to do much toward cleaning out the deposits and bars in the prisms, although the contractors have been directed to do so at the earliest practicable period.

"There is at the present time, and has been for the past three weeks, more snow and ice in the canal than at any previous time during the winter, and there is no prospect of being able to do much toward repairs before the first of the coming month.

"There is more or less deposit upon all the sections, the accumulations of former years, but the amount of such deposits removed during the spring repairs of 1868 and 1869, *and which will be removed the coming spring*, will, it is confidently anticipated, place this division of the canals in such condition as to give a good navigation and the requisite depth of water for the ensuing season, and guard against obstructions and interruptions to same.

"The statement of the Division and Resident Engineers, hereto annexed, shows in detail the present condition and future requirements of each of the sections on this division, to put them in such repair as is deemed compatible with the public interest.

"Such contracts as have adequate prices, it is fair to calculate, can be enforced ; such as have not, it is reasonable to conclude, will be surrendered."

The contracts which were inadequate in price to do the work which the engineers had, upon an examination of the several sections, deemed necessary to be done, were surrendered, although the contractors for said sections had, previous to that time, made such repairs as to maintain good navigation and keep the structures in serviceable condition ; many of them had, however, run their life and required renewing, and their prices being too low to enable them to do said work without

serious loss, their only alternative was to surrender them as they did, and allow the State to make the repairs and rebuild the structures which they would have been compelled to have done had they continued said contracts, as the Commissioners have the power, under the law repealing the contract system, which they did not before possess, to recommend the abandonment of any such contract, for dereliction of duty on the part of the contractor under the same, inconsistent with the interests of the State.

This power influenced the surrender of said contracts, as it proves an incentive to more vigorous exertion, prompt action, and general better performance of those yet remaining in existence.

The amount of prism excavation done last spring, in addition to that before done, alluded to in the report to the Canal Board before mentioned, did afford a good channel and a free and unobstructed navigation during the past season ; and which, together with extensive repairs and rebuilding of structures more particularly detailed in subsequent parts of this report, made the expenses large, however economically and judiciously done, and much beyond the very unremunerative prices of any of said contracts.

It does not follow that, because you have got a contractor to agree to do a piece of work for fifty or more per cent below its value, that you are to get the work done for that sum, but rather that you have got to pay its fair cost by driving him from the contract, giving some other party a fair price therefor, or doing it by the day under direction of the agents of the State.

The whole cost of repairs and for new work and structures, including materials, boats, tools, etc., taken from repair contractors, during the last fiscal year, on the sections surrendered the 1st of April last, is as follows :

Section No. 12, Erie canal.....	\$48,038 52
Less as per resolution of Canal Board,	
June 2, 1870	3,087 75

Section No. 13, Erie canal	\$44,950 77
" 1, Genesee Valley canal.....	80,497 78
" 3, " " "	67,434 64

	57,284 09

Amount paid for materials, boats, tools, etc., taken from repair contractors on the same sections :

Section No. 12, Erie canal	\$5,571 01	
Less amount now on hand.....	4,919 60	
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Section No. 13, Erie canal.....	\$18,839 65	
Less amount now on hand.....	8,470 35	
	<hr/>	
Section No. 1, Genesee Valley canal....	\$3,493 73	
Amount now on hand	5,897 65	
	<hr/>	
Section No. 3, Genesee Valley canal....	\$1,913 11	
Amount now on hand	2,881 49	
	<hr/>	
		Excess.
		2,403 92
	<hr/>	
		Excess.
		968 38
	<hr/>	

Amount paid for new work and structures on same sections :

Section No. 12, Erie canal	\$6,094 73
" 13, ".....	12,042 37
" 1, Genesee Valley canal.....	15,395 96
" 3, " ".....	9,638 59
	<hr/>

Leaving the amount paid for ordinary repairs on same sections, aside from above, as follows :

Section No. 12, Erie canal	\$38,204 63
" 13, ".....	58,086 11
" 1, Genesee Valley canal.....	49,634 76
" 3, " ".....	46,678 12
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REPAIRS OF ERIE CANAL.

SECTION No. 10.

WILLIAM F. ASHLEY, *Superintendent.*

This section is thirty-five miles in length, and extends from the east to the west line of Wayne county. It is under contract with Benjamin Butler, to be kept in repair at the annual compensation of \$34,000.00.

The mechanical structures on this section are as follows : One double lift lock ; eight single lift locks ; twelve iron truss road bridges ; twenty wooden road ; two wooden road and change ; one farm and change and eight wooden farm bridges ; three waste-weirs ; three composite and nineteen stone culverts ; two wooden trunk aqueducts ; eight lock and nine watch houses, and one work shop and shed.

Previous to opening canal last spring, material was excavated from prism, at several places on Clyde, Lock Berlin, Lyons and Poor-house levels, and also a considerable amount on seventeen mile level, above

Macedon. The lock chambers were bailed out and the flooring, mitre sills, valves and gates, thoroughly repaired. The towing-path has been raised, graded, ditched and graveled at various points between Clyde lock and county line; at Lockville and other places, considerable new coping timber, secured with ties, has been placed on vertical walls; three timber bridges have been rebuilt. All of the timber bridges on the section are substantially new, except one in the village of Lyons, which should be reconstructed of iron next season, as it connects with the bridge across Mud creek, which the town has already built of iron. Two bridges at Clyde, three at Lyons, two at Newark, one each at Port Gibson, Palmyra and Macedon, have had iron inserted in place of wood beams; and the contractor has replaced the roadway and coping plank and joists of all these bridges, with new timber.

A new iron bridge has been constructed in place of the old wooden structure at Market street, Palmyra, and also a new iron bridge in place of the old bridge on Railroad avenue, Palmyra, and the easterly bridge has been abandoned with the consent of the citizens and corporate authorities of the village.

Four new lock houses have been built; one at Clyde lock, one at Lock Berlin, one at Poor-house and one at Lockville locks.

No detentions have occurred on this section, except those that have occurred in consequence of the occasional breaking of the composite valves in the locks, and detentions from these causes have been very slight. These valves should be removed and wrought iron ones inserted in their stead. Some bottoming should be done on the Clyde level from Railroad bridge east and imminently below Clyde lock; also quite an amount between Macedon and west end of section. West of Port Gibson considerable of the berne bank has slid in, carrying the slope wall with it. This bank is a bed of quick sand and very difficult to maintain. It will have to be removed the coming winter. The locks will have to be thoroughly overhauled in the spring as usual. Two new toe-posts and an upper berme gate required at Clyde lock; one new gate at Lock Berlin. Some repairs to mitre sills and mitre sill platform at Poorhouse; an entire new set of gates at Middle lock at Lockville, and mitre sills repaired at upper Macedon lock.

The waste-weir at Lock Berlin to be rebuilt, new timber work to be put in at Newark waste-weir, and new gates and gate frame in waste-weir at Clyde.

The tow-path sluices at Clyde and Macedon to be carefully examined and repaired or renewed as may be required.

The cost of repairs for the fiscal year ending September 30, 1870, has been \$34,000.

SECTION No. 11.

MATTHEW RIGNEY, *Superintendent.*

This section is forty miles in length, and extends from the east line of Monroe county, to the west end of construction section No. 284, in the village of Brockport, and includes the Genesee river feeder and structures connected therewith, and the towing-path bridge across the Genesee Valley canal at its junction with the Erie canal. It is under contract with Valentine F. Whitmore, to be kept in repair, at the annual compensation of \$43,500.

The mechanical structures on this section are as follows: Five lift locks, one guard lock (not in use), one weigh lock, three stop gates, one stop dam, one aqueduct, eight waste-weirs, forty-one culverts, one wood farm bridge, one wood foot bridge, thirty wood road bridges, three wood tow-path bridges, one iron tow-path, twenty-six iron road bridges, one iron swing bridge, three lock houses, five watch houses, and one dam across the Genesee river at the rapids.

The additional iron road bridge above reported, is a new structure in west part of village of Brockport, recently completed.

A new timber road bridge has been constructed, by the repair contractor, during the season, in place of the old one on Hiscock's road, east of Spencerport. The timber bridges at Smith street, Rochester, and at Normans, Websters and Wiltsies, have been thoroughly repaired during the season, and such repairs made to all other bridges on the section as to put and keep them in good order. Smith street bridge, in the city of Rochester, is an old structure, and will require rebuilding some time next season. I recommend that it be rebuilt of iron. The timber work of waste-weir on Adam's Basin, was renewed previous to the opening of navigation. New mitre sills were inserted in all the locks, the gates and flooring repaired, and the walls and docking at head and foot of same repaired or rebuilt, as the necessities of the case seemed to require. The prism of canal was thoroughly cleaned out from Henpeck to west end of section, and also all bars at other points; considerable vertical wall was rebuilt at Brockport and other places.

During the spring flood Thomas creek broke through the berme bank of the canal and washed into prism several thousand yards of

material which was excavated by the repair contractor. The channel of the creek has since been deepened and widened, which it is hoped will prevent a recurrence of the disaster.

The work done last winter under the contract for deepening and improving the canal through the city of Rochester has very materially benefited and facilitated navigation during the season, not only by furnishing increased depth of water, but by increasing the facilities for weighing and forwarding boats at the weigh-locks.

During the season the different structures have received the needed repairs. Protection has been placed upon banks where needed, the towing-path graded, ditched and graveled from Spencerport to Brockport; also between Miller's and Pittsford locks, and from Pittsford lock to Cartersville.

The following are the detentions which have occurred on this section: The breaking of a lower gate at lock No. 63, July 22, caused a detention of thirty hours. A heavy leak around and under a composite culvert in Brighton, September 6th, caused a detention of seventy-two hours. Aside from detentions caused as above stated, navigation has been uninterrupted to this date.

The principal repairs required previous to opening of canal next spring will consist of removing deposit from prism in Perrinton swamp, around bend west of Fairport; the trimming off the inside slope of earth bank in front of sheet-docking on Irondequoit embankment, and removing deposit at various other points; the sheet-docking on inside face of Irondequoit embankment to be renewed; the tow-path bank west of Spencerport protected with stone; the composite culvert at which leak occurred thoroughly overhauled, as also the head of the culvert now stopped up near Spring-house; a leak through seams in the rock near Drake's bridge, cut off by blasting out rock and building a concrete wall; the putting in several new gates in the Brighton locks, and otherwise thoroughly repairing same; the rebuilding of quite a large amount of vertical wall at Brockport, Fairport and other places; the raising and protecting a portion of the west bank of Genesee River feeder. The tow-path bridge across Genesee Valley canal, at its junction with the Erie canal, should also be rebuilt; and from its being a bridge of long span and a very important one, I would recommend its reconstruction of iron.

The cost of repairs on this section for the fiscal year ending September 30, 1870, has been \$43,500.

SECTION No. 12.

LEWIS M. LOSS, *Superintendent.*

This section extends from the west end of construction section No. 284 (in Brockport) to the west line of Orleans county, and is thirty miles in length. It was under contract with Patrick H. Linneen up to the first day of April, at the rate of \$15,000 per year. At that date the contract was canceled under the provisions of act chap. 55, Laws of 1870, on application of the contractor; since that time the repairs have been made by the superintendent. The mechanical structures on this section are as follows: Eleven iron road bridges, twenty wooden road and three wooden farm bridges, six waste-weirs, forty-three culverts, one aqueduct, two stop gates, two bulk-heads, and one dam.

During spring repairs about 1,900 lineal feet of vertical walls at Albion, Medina, Eagle Harbor, Knowlesville and Shelby Basin were rebuilt in a very thorough and substantial manner, requiring a large amount of new stone to be delivered and used in their construction. A very large amount of slope wall was also rebuilt, which had slid out and fallen into the canal by the action of the frost. A large amount of material, consisting of earth and rock, was excavated from the prism, principally at the following named places: Near Miners, Holley, McGuire's, Hulberton, Brockville, Hindsburgh, Albion, Eagle Harbor, Starkweather's, Medina, and Shelby Basin. The waste-weirs were thoroughly repaired, and the woodwork of some of them entirely renewed.

Two stop gates, one west of Holley and one at Fish Creek culvert, were put in complete working order. One near Medina had become useless and an obstruction to the canal, and was taken out.

About 8,500 lineal feet of coping timbers, secured with ties, have been placed on the vertical walls at Medina, Albion, Eagle Harbor, and other places on the section.

Seven miles of the towing-path east of Albion, and four miles west of Medina, has been raised, graded, and ditched, and a sufficient number of sluices constructed to carry off surface water.

Five new wooden bridges have been constructed, to wit: Hastings, Gaines' Basin, Reed's, McGuire's, and Transit road.

Four iron bridges have been retimbered throughout, to wit: Ingersoll street, Albion, Hulberton, Medina, and Knowlesville.

Four iron and nine wooden bridges have been replanked and repaired.

The double-arch culvert at Lee's Mill, at Albion, has been repaired and made safe. The banks of the Tonawanda and Oak Orchard creek feeder have been raised, and the bulk-head and dam thoroughly repaired.

Seven bridges will require rebuilding next season, to wit: Bidwell's, Braley's, Starkweather's, Longbridge, Beal's, Miner's, and Tuttle's. The two last named should be of iron. The wooden needle beams in iron bridge at Eagle Harbor should be replaced with iron.

Considerable bottoming in prism of canal will be required, and undoubtedly considerable slope wall will have to be relaid before opening of navigation next spring.

About 3,000 lineal feet of vertical walls at Holley, Albion, and Knowlesville will require rebuilding, of increased thickness and strength. A culvert near Albion, which is now closed in consequence of having given out, ought to be put in order this winter. About four miles of towing-path should be raised, graded, and ditched next summer. It is also desirable that the sheet docking on inside face of high embankment at Holley should be replaced with slope wall, as the docking is decayed.

The feeder from the Tonawanda creek to its junction with Oak Orchard creek, south of Medina, should be cleaned out, which would very materially increase the volume of water supplied to the canal from that source.

Navigation on this section has been entirely uninterrupted from any cause during the season.

The following statement exhibits the expenditures by the superintendent during the fiscal year:

New work or structures.

Wood road bridges.....	\$2,414 73
New scow boats.....	2,280 00
Docking	1,400 00
	<hr/>
	\$6,094 73

Ordinary Repairs.

Repairing aqueducts.....	\$26 48
Repairing waste-weirs	9 55
Repairing culverts	590 35
Repairing wood farm bridges.....	15 00
Repairing wood road bridges.....	1,336 10
Repairing iron "	4,073 13
Repairing State scows.....	592 68
Repairing storehouses	9 00

Raising and repairing banks	\$5,799 41
Cleaning out bottom of canal.....	1,449 54
Repairing slope and vertical walls.....	5,490 06
Rapairing docking	341 35
Watching canal.....	1,612 25
Wheel-barrows	168 10
Tools	701 35
Miscellaneous	1,343 46
Repairing stop-gates.....	972 70
Repairing Medina feeder, bulk-head and dam	564 52
Superintendent's salary	690 00
	<hr/>
	\$25,785 03

The cost of ordinary repairs on this section for the past fiscal year has been as follows:

Paid by draft to Patrick H. Linneen, contract for repairs.....	\$7,500 00
Paid for boats, tools and materials, taken from contractor.....	5,571 01
Paid by draft to Wm. McRae, for extra work in excavating and taking out ori- ginal matter from the bed of the canal in 1868, (<i>see</i> resolution of Canal Board, June 2, 1870)	3,087 75
Expended by superintendent for new work or structures	6,094 73
Expended by superintendent for ordinary repairs	25,785 03
	<hr/>
Less materials, boats, tools, etc., on hand	\$48,038 52
	<hr/>
	4,919 60
	<hr/>
	\$43,118 92

SECTION No. 13.

WILLIAM MCRAE, *Superintendent.*

This section is twenty-six miles long and extends from the east line of Niagara county to Pickard's bridge, on Tonawanda creek.

Up to the first day of April last, it was under contract for repair with Frederick M. Mills, at the annual compensation of \$19,400; at which date it was canceled on application of the contractor, under the provisions of act chapter 55, Laws of 1870; since which time the repairs have been made by the superintendent.

The mechanical structures on this section are as follows: Five dou-
ble combined lift locks; one guard lock; one State race and two

bulk-heads; one stop gate; twenty-one culverts; four waste-weirs; seventeen wooden road, thirteen iron road, two wooden frame, one iron tow-path change and four wooden tow-path bridges; one lock and tool house, one workshop and timber shed.

Previous to opening of navigation last spring, the combined locks were put in complete working order by the insertion of nine new, large culvert valves, and extensively repairing eleven others; putting new lining in eight locks, and part new in two others; putting in two new stone and two timber mitre sills; inserting nine new lock gates and valves and repairing the others, and renewing a portion of the pier at head.

The guard lock at sulphur spring was also pumped out, the deposits removed from the bottom, and the gates and valves renewed and repaired.

New valves were inserted in waste-weir at Cady's; the masonry of weir at Jackson's partially taken up and relaid, and two new valves inserted and considerable work done to secure and strengthen those at Mabee's and Johnson's creek.

During the spring the canal was thoroughly cleaned and bottomed out, from Lockport locks for a distance of two miles east; the excavation consisting of earth and rock. Also, from the locks west to Sulphur Spring guard lock, at least 2,000 cubic yards of loose rock was removed from the prism, which had slid in from the high rock cut on the berme side. Considerable other material also was excavated and removed between the points named.

Bars, and other high places on other parts of the section were also removed.

About 2,500 cubic yards of vertical and slope walls were rebuilt at Middleport, Reynold's basin, Cataraact Spring, Orangeport, Lockport, Sulphur Spring and Pendleton.

The covered sluice from State ditch to canal in Pendleton has been almost entirely rebuilt.

The canal bridges rebuilt are Williams', Hurd's and Cady's, including raising the abutments of the last named. The bridges over State ditch, rebuilt, are Dunnigan's, Fisk's and Baker's, including the wooden abutments for same. The iron bridges retimbered are Mill and Chapel streets, at Lockport, Hawley's, Heacock's and Pendleton. A new bridge has also been constructed over Ransom creek. The work of putting in new joists and flooring in the large bridge on Main street in Lockport is in progress. Nearly all of the towing

path on this section has been raised, graded, ditched and gravelled. About five and three-fourth miles of new coping timber secured with ties, has been placed upon vertical walls, and about one and a half miles of old timber secured with new ties; considerable sheet docking at Orangeport, Middleport and Pendleton has been renewed.

The State ditch, about five miles in length, in towns of Lockport and Pendleton, have been thoroughly cleaned out.

Navigation has been entirely uninterrupted from any cause during the season.

The usual cleaning out of bars and deposit will be needed on this section next spring, some new gates will be required in combined locks, and the usual repairs to lock bottoms, gates, valves and mitre-sills. The timber docking between the tow-path bridges at Pendleton should be rebuilt of stone. The pier at Pickard's bridge must be protected and secured. The wooden needle beams in Young's bridge should be replaced with iron. Wakeman's road bridge will need some repairs.

Transit street iron bridge, in the city of Lockport, was badly damaged by a boat burning under it, and is not placed on the line of the street. The bridge should be rebuilt on a more substantial plan and placed on the street, both abutments being already built.

Aside from those above named, the structures on the section are in good condition, and a comparatively small outlay each season for repairs will keep them so for some years.

The following statement exhibits the expenditures by the superintendent during the fiscal year:

New Work or Structures.

Lock-gates	\$482 12
Wood road bridges.....	1,412 67
Wood tow-path bridges	99 00
Bulk-head and pier at Lockport locks	1,337 88
Docking	8,710 70
	<hr/>
	\$12,042 37

Ordinary Repairs.

Repairing locks.....	\$4,912 90
Lock-tending.....	5,407 50
Oil and gas for locks	379 36
Repairing lock-gates.....	1,583 77
Repairing waste-weirs	550 78
Repairing culverts	541 25

CANAL COMMISSIONERS.

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Repairing wood road bridges	\$955 77
Repairing iron road bridges	2,036 76
Repairing wood tow-path bridges	31,50
Repairing State scows	864 75
Repairing lock houses	64 50
Raising and repairing banks	6,649 87
Cleaning out bottom of canal	5,743 31
Repairing slope-wall	1,309 62
Watching canal	1,396 50
Wheelbarrows	337 50
Tools, etc	1,041 22
Miscellaneous	1,533 70
Cleaning out large back ditches, etc., on the mountain ridge, in the towns of Lockport and Pendleton	3,796 20
Superintendent's salary, etc	797 00
	<hr/>
Deduct for voucher not paid	\$39,933 76
	18 00
	<hr/>
	\$39,915 76

The cost of ordinary repairs on this section for the past fiscal year has been as follows:

Paid by draft to Frederick M. Mills, contract for repairs	\$9,700 00
Paid for boats, tools and materials	18,839 65
Expended by superintendent for new work or structures	12,042 37
Expended by superintendent for ordinary repairs ...	39,915 76
	<hr/>
Less materials, boats, tools, etc., on hand	\$80,497 78
	8,470 35
	<hr/>
	\$72,027 43

SECTION No. 14.

JAMES MOONEY, *Superintendent.*

This section is nineteen miles long, and extends from Pickard's bridge over Tonawanda creek to the city of Buffalo, including the Main and Hamburg Street and Clark and Skinner canals, and the canal basins and slips in said city. It is under contract with George D. Lord for repairs, at the annual compensation of \$44,400. This section was under the charge of F. B. Gallagher, as superintendent, until his decease in July last. Since the 1st of September it has been under the charge of James Mooney as superintendent.

- The mechanical structures on the section are twenty-four iron road, two iron swing, three iron change, six wooden road and farm, three wooden tow-path and two wooden tow-path draw-bridges, three culverts, two waste-weirs, one river lock, one guard lock and bulk-head, one ship lock, one dam and bulk-head, two spillways, Erie basin breakwater, Black Rock pier, stone jetty pier at entrance of Erie basin and pile jetty pier at entrance of Black Rock harbor.

The more important repairs made on this section during the season have been the rebuilding the tow-path bridges over slips Nos. 1 and 3 in Buffalo; one farm bridge on section No. 364; repairing vertical wall at numerous points between Black Rock guard lock and Erie street; renewing nearly all the coping timber and securing same with new ties on sections Nos. 369, 370, 371 and 372; widening and grading towing-path between York and Georgia streets; raising, widening and protecting with loose stone the towing-path bank along Niagara river, on sections Nos. 366 and 367; repairing and securing Black Rock pier at several points; raising, grading and ditching and inserting sluices in towing-path along Tonawanda creek; cleaning out State ditch at Tonawanda; raising, strengthening and securing the dikes along Tonawanda creek; renewing docking and vertical wall near Carolina street; repairing and securing the abutments and bridge over Peacock's slip, and the constant use of the dredge in removing deposit from the canal at various points on the section.

The extension of Black Rock pier, the raising and recoping of the old part of pier and the removal of a portion of the division bank near Buffalo and Niagara Falls railroad bridge, has materially improved navigation in Black Rock harbor, by raising the water about ten inches and preventing, to a great extent, the grounding of boats. The heavy current in the narrow canal still continues, and can only be relieved by an increased width of channel way, or the purchase of all private rights to use the water in the harbor.

The iron needle beams which were inserted in iron bridges during the last and present season have very much increased the strength and durability of the bridges in Buffalo, and will very materially reduce the expense of keeping them in repair for the future.

The principal repairs required next season are as follows: The construction of a new farm bridge on section No. 365; constructing two gates each for river lock, guard lock and ship lock; repairing slope wall between guard lock and change bridge on section No. 367;

constructing slope wall over Cornelius Creek culvert ; making the usual repairs to all the locks above named ; repairing vertical wall between change bridge and spillway at Tonawanda ; strengthening the berme bank at several places between the same points ; renewing one and three-fourths miles of docking on Tonawanda creek ; graveling the towing-path on the creek and on sections Nos. 364, 367, 369, 370, 371 and 372, and a vigorous prosecution of the dredging where required.

Navigation has been uninterrupted on the section during the season, but, as above hinted, great complaint is made by boatmen of the difficulty of navigating the narrow canal in Black Rock harbor, in consequence of the rapid current created in feeding the canal east. It is believed by those most experienced in the matter, that the present division bank should be removed, and one constructed farther into the harbor, making a canal channel of 120 or 150 feet in width, to correspond with size of channel from that point to Erie street in Buffalo, and thus so reduce the current in the canal as to offer no serious obstacle to navigation.

The cost of repairs on this section during the fiscal year has been as follows :

Paid by drafts on repair contract.....	\$44,400 00
Paid by drafts for rebuilding bridges over State ditch, Tonawanda.....	1,985 14
Paid by drafts for protection wall of State ditches at Tonawanda.....	1,365 41
Paid by drafts for rebuilding Barker's road bridge over State ditch, and clearing out State ditch north side of Tonawanda creek.....	2,784 73
	<hr/>
	\$50,535 28
	<hr/>

REPAIRS OF GENESEE VALLEY CANAL.

SECTION No. 1.

JOHN H. JONES, *Superintendent.*

This section is fifty-two miles long, extending from the junction with the Erie canal at Rochester to the terminus of the side cut at Dansville, including the feeders at Scottsville, Woodville and Dansville.

The mechanical structures are as follows: Nineteen lift locks, two guard locks, four dams, three bulk-heads, eight aqueducts, seven.

waste-weirs, fifty-five culverts, fifty-six wood farm bridges, one wood farm and change bridge, thirty-five wood road bridges, two wood road and change bridges, two wood tow-path bridges, seven iron road bridges and thirteen lock houses.

This section was under contract with Charles E. Candee, at an annual compensation of \$19,900, until April 1st, 1870, since which time the repairs have been made by the superintendent. The contract was surrendered to and accepted by the Canal Board, March 26th, to take effect on the first of April, and the tools and materials belonging to the contractor were purchased by the State at a cost of \$3,493.73 This surrender having taken effect before anything had been done by the repair contractor toward making spring repairs, the whole work of preparing the canal for navigation devolved upon the superintendent, and, although considerable bottoming out had been done the previous spring, yet a large amount remained to be done to insure proper navigation ; under this state of facts, the expenditures have been unavoidably quite large, but all the benefits expected to accrue have been fully realized in a season of almost uninterrupted navigation.

The opening of navigation on this section occurred on the 20th of May, having been somewhat delayed in consequence of the scarcity of labor, the difficulty in procuring tools and the lateness of the season at which the work was commenced. But little delay to navigation has occurred this season. One or two days delay occurred in July on that portion of the section between Mount Morris and Rochester, in consequence of the withdrawal of the water in order to cut the eel grass, which upon some of the levels had grown to such an extent, as to retard the flow of water, making it impossible to keep the lower end of long levels up to the requisite height to float loaded boats. Two days delay also occurred in August, in consequence of a small breach in the six mile level. Since the close of the last fiscal year and up to the time of the surrender of the contract, but little work was done under it, aside from that necessary to maintain navigation and to keep the bridges in passable condition, except at the Mount Morris slide.

In December last, soon after the close of navigation, an extensive land slide occurred from the hill side between the village of Mount Morris and the Genesee river. About one acre of the surface broke loose and slid down into the canal, filling the entire prism for about three hundred feet in length to a depth of from five and one-half to

twenty feet. The contractor commenced the work of removal in January, and worked steadily upon it until the contract was surrendered, after which the Superintendent completed the work. A new iron road bridge has been constructed on Railroad avenue in the village of Mount Morris, under a special act.

The Adams and Atkinson street bridges in the city of Rochester, are now under contract to be rebuilt of iron, under the act authorizing change of plan in bridges.

The feeder dam at Scottsville, is being rebuilt entire, and the guard banks connected therewith, strengthened and secured.

The Piffardinia waste-weir which had been in disuse for two or three years, has been brought into use again, after receiving thorough and extensive repairs.

The trunk of Baird's Creek aqueduct has been renewed and the masonry at head of pier repaired.

Nearly all the wood bridges on the section have received more or less repairs. The several lock houses upon the section had been neglected and were in poor condition. Extensive repairs have been made on them and they are now generally in good order.

One house at Scottsville, has been purchased by the Commissioner for a lock house at a cost of \$450, the State not having heretofore owned one there.

The following statement exhibits the expenditures by the superintendent during the fiscal year :

New Work or Structures.

Lock gates (one for lock No. 1)	\$127 61
State scow (one, Daniel Richmond).....	1,922 42
Wood farm bridges (one, Sackett's).....	320 17
Dam (one, Scottsville feeder)	13,025 76
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Total.....	\$15,395 96

Ordinary Repairs.

Repairing locks.....	\$1,826 67
Lock tending.....	1,724 86
Oil for locks	4 00
Repairing lock gates	813 69
Repairing aqueducts.....	818 76
Repairing waste-weirs	555 79
Repairing culverts	819 90
Repairing wood farm bridges	2,142 16
Repairing wood road bridges	1,830 15

Repairing wood tow-path bridges	\$71 77
Repairing State scows	587 64
Repairing under-water excavators	83 20
Repairing lock houses	1,576 14
Repairing piling machines	15 85
Raising and repairing banks.....	6,402 58
Cleaning out bottom of canal.....	9,177 29
Clearing out creeks.....	776 21
Repairing dams.....	923 42
Repairing docking	1,438 07
Repairing breaches	213 95
Watching canal.....	458 72
Wheel-barrows	350 50
Tools, etc.....	816 59
Miscellaneous	1,505 33
Cutting thistles, etc.....	213 00
Assisting boats.....	26 00
Slide at Mount Morris.....	2,722 71
Superintendent's salary, etc., from April to October...	750 00
Total.....	<u>\$38,144 96</u>

The east abutment of the State dam across the Genesee river at Mount Morris has, from decay (being of timber), become very unsafe, and the permanency of the whole structure is thereby materially endangered. It should be rebuilt the ensuing year in a more substantial manner. In case it should give way, navigation upon the whole canal would necessarily be suspended for a long time.

A workshop and storehouse is very much needed upon this section, and should be built immediately, as there is no place upon the section in which to store tools and materials over which the State authorities have control; consequently, tools are lost and materials decay, or are lost, and much damage to the State accrues.

Several sets of lock gates will require to be renewed before the opening of navigation next spring; and the use of a workshop the ensuing winter would very much facilitate the framing of the necessary timber.

The aqueducts over Canaseraga, Bradner and Rock Spring creeks will require extensive repairs. The waste-weirs at McNair's, near Scottsville, and at York landing, require overhauling and repairing to a considerable extent.

The apron at the foot of the river lock at Mount Morris has become detached from its foundation, and there is danger that the lock walls may be undermined. The expense of making the repairs will be

considerable, as it will be necessary to construct coffer-dams in order to drain the work.

Seven wood farm bridges will require rebuilding within the fiscal year.

The road bridge at Canawaugus is an old wood structure, and will soon require rebuilding, it is located on a main thoroughfare, over which there is a large amount of travel, and I would recommend that an iron bridge be substituted.

The same remarks will apply to the Cumminsville bridge, near Dannsville.

The river bridge at Mount Morris to which the towing-path is attached is in a very unsafe condition, and requires extensive repairs.

The four mile, or Scottsville feeder level, will require bottoming out for nearly its entire length.

The cost of repairs on this section for the past fiscal year has been as follows :

Paid by draft on Chas. E. Candee's contract for repairs.	\$9,950 00
Paid for boats, tools, and materials.....	3,498 73
Expended by superintendent for new work or structures	15,395 96
Expended by superintendent for ordinary repairs.....	38,144 95
Paid for lock-house at Scottsville, see resolution of Canal Board, Sept. 3, 1868.....	450 00
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	\$67,434 64
Less materials, boats and tools on hand.....	5,897 65
	<hr/>
	\$61,536 99

SECTION No. 2.

JAMES LEMEN, *Superintendent.*

This section is at present twenty-four miles in length, extending from the junction at the Shaker settlement to the south bank of the Wiscoy feeder at Mixville landing, including said feeder, dam, and bulk-head.

From the commencement of the fiscal year up to the 1st day of June last, the section extended from the junction at the Shaker settlement to the south bank of the Genesee river feeder at Oramel, a distance of thirty-six miles, including said feeder, and up to the 1st day of April was under the charge of Horace Hunt, Esq., as superintendent.

The mechanical structures upon the section as at present constituted are as follows : Fifty-two lift locks, four aqueducts, six waste-

weirs, one dam and bulk-head, twelve culverts, seventeen wood farm bridges, seventeen wood road bridges, one iron road bridge, four wood road and change bridges, one wood tow-path bridge, one wood foot bridge, one wooden trunk, one overflow spillway, six lock-houses, and ten watch-houses.

At the close of the fiscal year, September 30, 1869, the work of rebuilding the Wiscoy feeder dam was in progress. The rebuilding of the tow-path side and towing-path bridge of the Portage aqueduct was commenced immediately after the close of navigation, and, together with a large number of lock gates, were nearly completed on the 1st day of April.

Late superintendent Hunt had, during the fiscal year, built one new wood farm bridge (McNair's), three new wood road bridges, viz.: Townsend road, Second St. Nunda and Gibbs road, and had thoroughly repaired many of the other bridges. He had also done a large amount of work in maintaining navigation at the Portage slide.

The following statement exhibits the expenditures by Horace Hunt, late superintendent, during the fiscal year :

<i>New work or Structures.</i>	
Lock gates.....	\$5,732 43
Wood farm bridges.....	113 33
Wood road bridges.....	1,915 15
Dams (Wiscoy feeder) rebuilt in consequence of being washed away by flood	2,837 33
	<hr/>
	\$10,598 24

<i>Ordinary Repairs.</i>	
Repairing locks.....	\$641 92
Lock tending.....	2,503 59
Repairing lock gates.....	534 15
Repairing aqueducts	4,188 61
Repairing wood farm bridges	767 00
Repairing wood road bridges	1,068 46
Repairing wood tow-path bridges.....	4 00
Repairing State scows	2 50
Repairing lock houses.....	1 28
Repairing watch houses.....	7 42
Raising and repairing banks.....	2,670 87
Repairing docking	334 98
Breaking ice and assisting boats.....	170 00
Watching canal.....	632 75
Wheel-barrows	5 50

Tools, etc.....	\$97 73
Miscellaneous	537 04
Work at Portage slide.....	6,842 33
Superintendent's salary, etc.....	329 17
	<hr/>
	\$21,339 30

Navigation opened on this section on the 28th of May. It was found impossible to get it in readiness at the time appointed for opening the canals in consequence of the large amount of work to be done, the lateness of the season and the scarcity of labor.

A large amount of bottoming out was done on the levels between locks Nos. 17 and 60, at several points on the nine mile level and on the Wiscoy feeder level. Under the present superintendent, besides putting in the large number of lock gates framed by Mr. Hunt, ten new ones have been framed and inserted. The Cashuqua and Brushville aqueducts have been repaired; that at Brushville thoroughly. Three waste-weirs and two culverts have been repaired. Four wood farm bridges have been rebuilt, and several thoroughly repaired. Two wood road bridges have been rebuilt and others repaired. A large number of the composite locks have been repaired by renewing the plates, ties, anchors, studding and lining.

Previous to the opening of navigation last spring it became necessary to construct a towing-path across the slide at Portage, the former one having entirely disappeared.

A coffer-dam was constructed by driving two rows of piles, about eight feet apart, capping them with heavy timbers and tieing with wrought iron rods; on the inside face of both rows of piles sheet piling was placed and the space puddled in with the best selected material that could be procured, thus forming the towing-path. The work has stood admirably, and now appears to be secure. It has been necessary to keep the State dredge at work widening the channel at the slide thus far during the season; and, in order to dispose of the material taken out by it, a rail track was laid down upon the towing-path, the material dumped into cars, and then run off and thrown over the precipice. The work has been necessary in order to maintain navigation at this point.

But two or three days delay to navigation has occurred this season, and this delay occurred on account of the slide at Portage.

The following statement exhibits the expenditures by James Lemen, superintendent, during the fiscal year:

New Work or Structures.

Lock gates (10).....	\$2,487 30
Wood farm bridges (4).....	1,376 45
Wood road bridges (2).....	1,528 59
Wood, road and change bridges.....	401 87
Pile driver (1).....	445 95
Lock houses (5).....	146 02
	<hr/>
	\$6,386 18

Ordinary Repairs.

Repairing locks.....	\$6,307 07
Lock tending.....	4,824 77
Repairing lock gates.....	1,109 79
Repairing aqueducts	1,837 83
Repairing waste-weirs	51 50
Repairing culverts	76 50
Repairing wood farm bridges	112 33
Repairing wood road bridges	388 93
Repairing wood, road and change bridges	396 62
Repairing wood tow-path bridges	15 00
Repairing State scows	196 95
Repairing dredge	113 58
Repairing lockhouses.....	94 17
Raising and repairing tow-path, etc.....	2,705 14
Cleaning out bottom of canal.....	5,553 81
Repairing breaches.....	115 00
Repairing docking	174 94
Watching canal	1,977 00
Wheel-barrows	224 00
Tools, etc.....	469 25
Repairing spillway.....	96 97
Miscellaneous	959 82
Repairing wooden trunk near Portage	1 75
Opening side ditches, etc.....	665 51
Work at Portage slide.....	8,604 15
Superintendent's salary, etc	687 25
	<hr/>
	\$38,759 63

Work to be done prior to the opening of navigation in 1871: There will be at least forty new lock gates required; fifteen composite locks will need considerable repairs to lining; two of the old wood locks will require portions of the embankment of one side to each to be dug out, the sides pressed back and secured; some new mitre sills and hollow quoins will also be required. The Cashuqua aqueduct will require new sides, the Portage aqueduct will require extensive repairs to berme side, and the Wiscoy aqueduct a new trunk entire. Con-

siderable bottoming will be required to be done over the entire section.

Four waste-weirs will require new wood work, and before the close of the fiscal year three farm bridges, one road bridge and one foot bridge, all of wood, will require rebuilding. About 300 feet in length of the Wiscoy feeder bank will require a protection of brush and stone; and the towing-path just south of the village of Portageville also requires some protection against the flood waters of the Genesee river.

The cost of ordinary repairs on this section for the past fiscal year has been as follows :

Expended by Horace Hunt, late superintendent, for new work or structures	\$10,598 24
Expended by Horace Hunt, late superintendent, for ordinary repairs	21,339 30
Expended by James Lemen, superintendent, for new, work or structures	6,386 18
Expended by James Lemen, superintendent, for ordinary repairs.....	38,759 63
	<hr/>
	\$77,083 35

REPAIR SECTION No. 3.

Wm. A. KIRKPATRICK, *Superintendent.*

This section is at present thirty-two miles in length, extending from the south bank of the Wiscoy feeder at Mixville landing, to the west line of Allegany county, including the Genesee River feeder at Oramel, the Cuba reservoir and feeder, the Rockville reservoir and Griffin Creek feeder.

Prior to the 23d day of March, 1870, section No. 3 embraced that portion of the Genesee Valley canal, extending from the south bank of the Genesee River feeder, at Oramel, to the Allegany river at Millgrove pond. At the date mentioned, the Canal Board, by resolution, fixed the boundaries as extending from the south bank of the Genesee River feeder at Oramel, to the boundary line between the counties of Allegany and Cattaraugus.

On the 2d day of June, 1870, the Canal Board, by resolution, extended the section to the south bank of the Wiscoy feeder at Mixville landing, leaving it as now constituted.

The mechanical structures upon the section are as follows: Thirty-five lift locks, one guard lock, three aqueducts, seven waste-weirs, twenty-five culverts, two reservoir culverts and wells, two reservoir

spillways, twenty-nine wood farm bridges, two wood river road bridges, twenty-seven wood road bridges, three iron road bridges, one wood tow-path and road bridge; one wood road and change bridge, five lock houses and twelve watch houses.

The following statement exhibits the expenditures by Horace Hunt, late superintendent during the fiscal year:

<i>New Work or Structures.</i>	
Lock gates.....	\$888 93
Wood farm bridges.....	159 43
Wood road bridges.....	2,694 46
	<hr/>
	\$3,742 82

<i>Ordinary Repairs.</i>	
Repairing locks.....	\$462 43
Lock tending.....	436 60
Repairing lock gates.....	22 19
Repairing aqueducts.....	137 75
Repairing wood farm bridges	613 24
Repairing wood road bridges	867 81
Repairing State scows.....	5 50
Repairing lock houses	15 00
Raising and repairing banks.....	245 50
Clearing out creeks.....	862 32
Repairing dams.....	67 00
Repairing breaches.....	1,141 96
Breaking ice and assisting boats.....	56 25
Watching canal.....	220 50
Tools, etc.	26 45
Miscellaneous	250 75
Protecting and securing bridge approach, etc., near Oramel basin.....	680 00
Superintendent's salary, etc.....	329 16
	<hr/>
	\$6,440 41

Expenditures by James Lemen, superintendent, during the fiscal year:

<i>Ordinary Repairs.</i>	
Repairing locks.....	\$1,115 79
Lock tending.....	100 75
Cleaning out bottom of canal	3,444 87
Repairing docking.....	57 39
Repairing breaches.....	34 50
Clearing out creeks	22 00
Watching canal.....	9 00

Wheel-barrows	\$75 00
Tools, etc.....	46 41
	<hr/>
	\$4,905 71

Thirty-eight new lock gates have been built and inserted; three new wood road bridges have been constructed; one iron road bridge over Griffin Creek feeder has been built by contract; the Genesee River feeder at Oramel has been thoroughly dredged out, and bottoming out has been done on nearly every level upon the section; several composite locks have been thoroughly repaired, as have also many of the wood bridges.

Expenditures by William A. Kirkpatrick, superintendent, during the fiscal year:

New Work or Structures.

Lock gates.....	\$2,984 00
State scows	1,919 66
Wood road bridges.....	992 11
	<hr/>
	\$5,895 77

Ordinary Repairs.

Repairing locks.....	\$4,398 30
Lock tending.....	3,583 31
Repairing lock gates.....	513 50
Repairing aqueducts	985 90
Repairing waste-weirs.....	230 09
Repairing wood farm bridges	80 99
Repairing wood road bridges	1,094 48
Repairing State scows	344 51
Raising and repairing banks.....	5,575 08
Cleaning out bottom of canal	8,924 12
Cleaning out creek channels	704 83
Watching canal.....	459 70
Wheel-barrows	150 00
Tools, etc.....	112 65
Miscellaneous	855 48
Changing creek channel.....	1,073 33
Clerk hire	450 00
Superintendent's salary	600 00
	<hr/>
	\$30,136 27

There have been eight days detention to navigation during the season, caused by the giving way of Caneadea and Houghton Creek aqueducts. Navigation opened on the 20th of May.

The following work will be required to be done prior to the opening

of navigation in 1871: The timber and plank lining to at least ten composite locks will require renewing or extensive repairs; the foundation planking to lock No. 96 requires renewing; twelve new mitre sills and at least fifty new lock gates are required with extensive repairs to all old ones not renewed; the ends of Cold Creek aqueduct will require extending, and Houghton Creek aqueduct some repairs. The waste-weir on Summit level, near bridge No. 45, must be rebuilt; it is not now in use. The waste-weirs at Fillmore, near lock No. 89, and at Cuba, will require extensive repairs. Bottoming out will have to be done on a greater part of the section. During the fiscal year at least six new wood bridges will be required. The towing-path bank at the waste-weir near Fillmore is in danger of being washed away by the flood waters of the Genesee river, and should be protected without delay.

The cost of ordinary repairs on this section for the past fiscal year has been as follows:

Paid by draft on Fayette Bristol's contract for repairs.	\$4,250 00
Paid for boats, tools, materials, etc.....	1,913 11
Expended by Horace Hunt, late superintendent, for new work or structures	3,742 82
Expended by Horace Hunt, late superintendent, for ordinary repairs.....	6,440 41
Expended by James Lemen, superintendent, for ordi- nary repairs.....	4,905 71
Expended by Wm. A. Kirkpatrick, superintendent, for new work or structures	5,895 77
Expended by Wm. A. Kirkpatrick, superintendent, for ordinary repairs	30,136 27
	<hr/>
	\$57,284 09
Less materials, boats, tools, etc., on hand.....	2,881 49
	<hr/>
	\$54,402 60

REPAIR SECTION No. 4.

JOHN L. ADAMS, *Superintendent.*

At a meeting of the Canal Board, held March 25th, 1870, this section was, by resolution, erected out of that portion of section No. 3 extending from the boundary line dividing the counties of Allegany and Cattaraugus to the Allegany river at Millgrove pond, and is twenty miles in length.

The mechanical structures upon the section are as follows: Seven lift locks, two guard locks, four aqueducts, six waste-weirs, five culverts, four dams, two bulk-heads, fifteen wood farm bridges,

twelve wood road bridges, one iron road bridge, two wood tow-path bridges and four lock houses.

Nineteen new lock gates have been built and inserted; two wood road bridges have been built; one iron road bridge has been built by contract; two lock houses have been erected; a new cess-pool dam at Hinsdale has been built; and extensive repairs have been made to the Ischua Feeder aqueduct, Olean Creek aqueduct on main canal, and the two aqueducts on the extension. All the bridges have received more or less repairs. Bottoming out has been done upon nearly all that portion of the main canal embraced in this section; also for about two-thirds the entire length of the extension.

The following statement exhibits the expenditures by John L. Adams, superintendent during the fiscal year:

<i>New work or Structures.</i>	
Lock gates.....	\$2,004 83
Cess-pool dam.....	401 50
Wood road bridges.....	547 42
Lock houses.....	790 79
State scows	1,000 00
	<hr/>
	\$4,744 54
<i>Ordinary Repairs.</i>	
Repairing locks	\$1,408 17
Lock tending	880 83
Repairing lock gates	357 22
Repairing aqueducts	1,623 46
Repairing waste-weirs	160 15
Repairing wood farm bridges	575 60
Repairing wood road bridges	619 99
Repairing tow-path bridges	79 64
Repairing iron road bridge	5 62
Repairing State scows	110 46
Repairing lock houses	126 30
Raising and repairing banks	1,562 34
Cleaning out bottom of canal.....	2,017 75
Repairing dams	226 23
Repairing docking	27 80
Watching canal	530 00
Wheel-barrows	75 00
Tools, etc.	173 60
Miscellaneous	179 79
Clerk hire	450 00
Superintendent's salary, etc.	749 50
	<hr/>
	\$11,939 45

The following work should be done prior to the opening of navigation in 1871:

The trunks of the two aqueducts on the extension at Olean should be renewed; the waste-weir at Hinsdale will require thorough repairs, and all the others more or less repairs. Eight new lock gates will be required; the mitre sills of all the locks either require renewing or extensive repairs; the masonry at head of all composite locks require calking, and considerable bottoming out will be required to be done.

Navigation opened on this section on the 20th of May, and there have been no detentions during the season.

The cost of ordinary repairs on this section, for the past fiscal year, has been as follows:

Paid by draft on Fayette Bristol's contract for repairs..	\$4,250 00
Paid for materials, boats, tools, etc.....	2,020 10
Expended by superintendent for new work or structures,	4,744 54
Expended by superintendent for ordinary repairs	11,939 45
	<hr/>
	\$22,954 09
Less materials, boats, tools, etc., on hand.....	1,397 05
	<hr/>
	\$21,557 04
	<hr/>

TABLE No. 1.

Work completed during fiscal year ending Sept. 30th, 1870.

The following works, authorized by the Legislature and Canal Board, have been completed during the fiscal year ending Sept. 30th, 1870, and the final accounts rendered for same:

ERIE CANAL.

CHARACTER OF WORK	PAID BY DRAFTS.		Total.
	Amount paid during fiscal year.	Amount previously paid.	
<i>Ordinary Repairs.</i>			
Wall and docking on State ditch, Tonawanda.....	\$1,365 41	.....	\$1,365 41
Rebuilding and repairing bridges over State ditch, Tonawanda.....	1,985 14	.....	1,985 14
Rebuilding Barker's road bridge over State ditch, and cleaning out State ditch north side of Tonawanda creek.....	2,784 73	.....	2,784 73
Total	\$6,135 28	.....	\$6,135 28
<i>Extraordinary Repairs.</i>			
Vertical wall on berme side, in Albion.....	\$8,300 00	.....	\$8,300 00
Pile jetty pier, at Black Rock.....	1,572 68	\$5,000 00	6,572 68
Improving Main and Hamburg street canal.....	1,644 28	9,360 00	11,004 28
Completing Clark and Skinner canal.....	471 19	15,000 00	15,471 19
Constructing dock along Howard Agricultural Works, Main and Hamburg Street canal.....	8,295 24	.....	8,295 24
Removing 800 feet Division bank, Black Rock harbor.....	9,452 72	.....	9,452 72
Protecting docking of Ohio basin, and deepening slip.....	2,043 46	2,350 00	4,392 46
Inserting iron needle beams in bridges on West avenue, Rochester, and Main street, Brockport.....	1,872 08	.....	1,872 08
Vertical wall at Port Gibson.....	454 24	1,360 00	1,814 24
Bridge abutments for bridge to connect Perry and Smith streets, Brockport.....	394 60	2,020 00	2,344 60
Swing bridge on Exchange street, Rochester.....	580 00	8,220 00	8,800 00
Iron bridge at Brockport.....	7,344 47	.....	7,344 47
Towing-path bridge near Macedon.....	2,460 18	.....	2,460 18
Iron bridge on Pittsford road.....	2,444 41	.....	2,444 41
Iron bridge on Market street, Palmyra.....	4,997 66	.....	4,997 66
Stop-dam at junction of Genesee River feeder and Erie canal.....	1,767 06	.....	1,767 06
Additional sluice culvert in Pendleton.....	2,986 76	.....	2,986 76
Raising tow-path and wall of section No. 368, Black Rock port.....	7,900 14	.....	7,900 14
Total	\$56,247 61	\$48,310 00	\$99,557 61
<i>Work Committed for.</i>			
Bridge over channel from Carterville waste-weir, on road leading to Bushnell's basin.....	\$1,000 00	.....	\$1,000 00
Protecting lands of A. P. Seaman from wash of waste-weir channel.....	2,000 00	.....	2,000 00
Total	\$3,000 00	.....	\$3,000 00

GENESEE VALLEY CANAL.

Ordinary Repairs.

Rebuilding in part locks Nos. 12, 16, 18 and 19.....	\$183 84	\$10,860 00	\$11,042 84
Rebuilding in part locks Nos. 29, 33, 36, 38 and 37.....	190 53	12,340 00	12,460 53
Rebuilding in part locks No. 49, 39 and 40.....	1,928 42	18,300 00	15,222 42
Rebuilding in part lock No. 68, and guard-lock.....	1,616 49	10,980 00	12,696 49
Total	\$3,842 27	\$46,480 00	\$52,322 27

TABLE No. 1—(Continued).
GENESEE VALLEY CANAL.

CHARACTER OF WORK.	PAID BY DRAFTS.		Total.
	Amount paid during fiscal year.	Amount previously paid.	
<i>Extraordinary Repairs.</i>			
Ischua reservoir.....	\$6,774 23	\$15,400 00	\$22,144 23
Ischua feeder.....	2,207 78	1,600 00	3,807 78
Protecting tow-path near lock No. 71, and bank of Genesee River feeder, Oramel.....	2,884 00	5,000 00	7,884 00
Overflow spillway, below Nunda.....	3,724 22	1,800 00	5,024 22
Channel from Genesee river to Murray Mill canal, Mount Morris.....	65 56	280 00	345 56
Iron bridge at Mount Morris.....	4,759 17	360 00	5,119 17
Deepening culvert near lock No. 2.....	1,981 08	.....	1,981 08
Improving and securing outlet of Rockville reservoir.....	1,944 04	.....	1,944 04
Dam, bulk-head and feeder at Smith's mills.....	1,915 26	4,200 00	6,115 26
Total.....	\$26,225 29	\$36,140 00	\$64,365 29

TABLE No. 2.

Works in progress at the close of fiscal year ending Sept. 30, 1870.

The following named works, authorized by the Legislature and the Canal Board, were under contract and in progress at the close of the fiscal year ending Sept. 30, 1870:

ERIE CANAL.

CHARACTER OF WORK.	PAID BY DRAFTS.		Total.
	Amount paid during fiscal year.	Amount previously paid.	
<i>Extraordinary Repairs.</i>			
Dredging Ohio basin.....	\$7,028 00	\$7,956 00	\$14,994 00
Extending Black Rock pier.....	2,295 00	2,635 00	4,930 00
Deepening and improving narrow canal in Black Rock harbor.....	.....	.....	.....
Improving and widening canal and constructing vertical wall between Erie and Commercial streets in Buffalo.....	.....	.....	.....
Protecting canal against encroachments of Lake Erie.....	.....	.....	.....
Raising and recoping Black Rock pier.....	7,395 00	.....	7,395 00
Extending, raising and strengthening division bank at lower Black Rock.....	.....	.....	.....
Improving and completing Main and Hamburg Street canal.....	1,360 00	.....	1,360 00
Dredging channel around north end of Erie basin break-water.....	11,424 00	595 00	12,019 00
Removing deposits from Black Rock harbor.....	6,898 50	1,233 50	8,132 00
Removing abutments and superstructure of old bridge and constructing new iron bridge over slip leading to river lock at Tonawanda.....	.....	.....	.....
Vertical wall on guard lock section and cleaning out mill race in Black Rock.....	.....	.....	.....
Removing old warehouse foundation at Black Rock.....	1,224 00	1,020 00	2,944 00
Doubling guard lock at Black Rock.....	5,270 00	.....	5,270 00
Iron bridge over Ohio basin slip on Fulton street, Buffalo.....	4,389 00	.....	4,389 00
Iron bridge on Georgia street, Buffalo.....	7,668 00	.....	7,668 00
Inserting iron needle beams in bridges on Ferry, Genesee, Prime and Michigan streets, Buffalo.....	.....	.....	.....
Inserting iron needle beams in bridges on Washington street, Main and Hamburg Street, canal.....	.....	.....	.....

TABLE No. 2—(Continued).

ERIE CANAL.

CHARACTER OF WORK.	PAID BY DRAFTS.		Total.
	Amount paid during fiscal year.	Amount previously paid.	
<i>Extraordinary Repairs.</i>			
Inserting iron needle beams in two bridges at Clyde, three at Lyons and two at Newark	\$8,587 00	.....	\$8,587 00
Inserting iron needle beams in bridges at Palmyra, Macedon and Port Gibson .....	.....	.....	.....
Inserting iron needle beams in bridges at Comstock st., Lockport, Adams Millards, Hindsburgh and Shelby sts, Medina	8,570 00	.....	8,570 00
Iron bridge at Orangeport .....	.....	.....	.....
Iron bridge at McCarthy's .....	.....	.....	.....
Iron bridge at Mabee's .....	.....	.....	.....
Wrought iron swing bridge at Albion, and two iron bridges at Brockville and county line .....	.....	.....	.....
Removing easterly bridge at Palmyra and constructing additional roadway to Railroad avenue bridge	6,800 00	.....	6,800 00
Timber bridge over waste weir channel near Cartersville	714 00	.....	714 00
Vertical wall at Pendleton .....	.....	.....	.....
Vertical wall near Shelby basin .....	.....	.....	.....
Vertical wall at Reynale's basin .....	.....	.....	.....
Vertical wall between 3d and 4th locks east of Rochester .....	.....	.....	.....
Removing bench walls and constructing slope and pavement wall between Lyons and Lockville	10,387 00	.....	10,387 00
Raising and improving Sulphur Spring guard lock	731 00	.....	731 00
Doubling Clyde lock	5,287 00	.....	5,287 00
Doubling lock Berlin lock	646 00	.....	646 00
Doubling Lyons lock	1,530 00	.....	1,530 00
Doubling Poor-house lock	6,395 00	.....	6,395 00
Doubling lower lock at Lockville	8,466 00	.....	8,466 00
Doubling middle lock at Lockville	15,470 00	.....	15,470 00
Doubling upper lock at Lockville	1,547 00	.....	1,547 00
Doubling lower Macedon lock	1,020 00	.....	1,020 00
Doubling Pittsford lock	3,332 00	.....	3,332 00
Doubling Miller's lock .....	.....	.....	.....
Doubling lock No. 3, east of Rochester .....	.....	.....	.....
Doubling lock No. 2, east of Rochester	2,805 00	.....	2,805 00
Doubling lock No. 1, east of Rochester .....	.....	.....	.....
Receiver for White's creek near Waynesport	221 00	.....	221 00
Additional sluice culvert in Lockport .....	.....	.....	.....
Stop-gate between Spencerport and Adam's basin .....	.....	.....	.....
Stop-gate between deep hollow culvert and wide water .....	.....	.....	.....
Changing towing-path and improving line of canal along high clay bluff	510 00	.....	510 00
Deepening Erie canal from 1st lock to Lyell st., Rochester	32,300 00	.....	32,300 00
Ditch to drain lands of Thos. McGuire .....	.....	.....	.....
Improving channel way and discharge culvert of Thomas creek	1,377 00	.....	1,377 00
Waste-weir on three mile level in Brighton .....	.....	.....	.....
Improving and protecting discharge from Newark waste-weir	18,175 00	.....	18,175 00
Constructing and testing steam canal dredge .....	.....	.....	.....
	\$174,807 50	\$18,488 50	\$188,246 00

TABLE No. 3.

Works in progress at the close of the fiscal year ending September 30th, 1870.

GENESEE VALLEY CANAL.

CHARACTER OF WORK.	PAID BY DRAFTS.		Total.
	Amount paid during fiscal year.	Amount previously paid.	
Protecting and securing slide bank, repair section No. 2..	\$30,338 00	\$36,485 00	\$56,763 00
Raising Oli Creek reservoir.....	53,550 00	54,570 00	108,120 00
Deepening Summit level from lock No. 97.....	.....	969 00	969 00
Iron bridge over Griffin creek, at Cuba.....	2,958 00	1,207 00	4,165 00
Iron bridge on State street, at Olean.....	1,518 00	.....	1,518 00
Iron bridge at Blood's farm, near Portage.....	.....	.....	.....
Iron bridge on Adams street, Rochester.....	328 00	.....	328 00
Iron bridge on Atchinson street, Rochester.....	328 00	.....	328 00
Rebuilding guard bank in town of Hume.....	.....	.....	.....
Completing the widening, deepening and improving the Genesee Valley canal at Rochester.....	40,800 00	.....	40,800 00
Cleaning out channel of Beard's creek, below aqueduct.....	782 00	.....	782 00
Total	\$130,577 00	\$83,181 00	\$213,758 00

STATEMENT showing the expenditures upon this division for and during the fiscal year ending September 30th, 1870.

ORDINARY REPAIRS.

NAME OF WORK OR EXPENDITURE MADE.	PAYMENTS.		Total.
	Amount paid during fiscal year.	Amount previously paid.	
<i>General Management.</i>			
Commissioner's salary and travel.....	\$2,400 00	.....	\$2,400 00
Clerk hire, office rent and contingent expenses of Canal Commissioner's office at Rochester.....	1,980 51	.....	1,980 51
Total.....	\$4,380 51	.....	\$4,380 51

Erie Canal.

Repair section No. 10.....	\$34,000 00	.....	\$34,000 00
Repair section No. 11.....	43,500 00	.....	43,500 00
Repair section No. 12.....	43,118 92	.....	43,118 92
Repair section No. 13.....	73,027 43	.....	73,027 43
Repair section No. 14.....	50,535 28	.....	50,535 28
Breaking ice between Rochester and Buffalo.....	440 00	.....	440 00
Tending swing bridge on Exchange street, Rochester.....	708 34	.....	708 34
Miscellaneous expenditure for same swing bridge.....	135 49	.....	135 49
Engineering and incidental expenses.....	670 50	.....	670 50
Services as lock tender raising water at Lockport after the close of navigation.....	28 00	.....	28 00
Services in inserting hydraulic scales.....	100 00	.....	100 00
Services of division agent, including travel.....	925 00	.....	925 00
Services of patrolmen.....	5,854 00	.....	5,854 00
Total	\$252,087 96	.....	\$252,087 96

STATEMENT—(Continued).

ORDINARY REPAIRS.

NAME OF WORK OR EXPENDITURE MADE.	PAYMENTS.		Total.
	Amount paid during fiscal year.	Amount previously paid.	
<i>Genesee Valley Canal.</i>			
Repair section No. 1.....	\$61,536 99	.....	\$61,536 99
Repair section No. 2.....	77,068 35	.....	77,068 35
Repair section No. 3.....	54,402 60	.....	54,402 60
Repair section No. 4.....	21,557 04	.....	21,557 04
On construction contracts as per Table No. 1.....	8,842 27	\$48,490 00	52,322 27
Service of man superintending steam dredge.....	732 00	.....	732 00
Miscellaneous expenditures for steam dredge.....	188 15	.....	188 15
Services of patrolman.....	158 00	.....	158 00
Engineering and incidental expenditures.....	8,890 25	.....	8,890 25
Total	\$223,390 65	\$48,490 00	\$271,870 65

EXTRAORDINARY REPAIRS.

Erie Canal.

On construction contracts as per Table No. 1.....	\$56,247 61	\$48,310 00	\$99,557 61
On work commuted for as per Table No. 1.....	3,000 00	.....	3,000 00
On construction contracts as per Table No. 2.....	174,807 50	18,488 50	188,246 00
Engineering and incidental expenses.....	12,827 65	.....	12,827 65
Printing and publishing notices of lettings.....	832 22	.....	832 22
Total	\$247,714 98	\$56,748 50	\$304,463 48

Genesee Valley Canal.

On construction contracts as per Table No. 1.....	\$26,225 29	\$28,140 00	\$54,365 29
On construction contracts as per Table No. 3.....	180,577 00	88,181 00	213,758 00
Engineering and incidental expenses.....	9,069 25	.....	9,069 25
Printing and publishing notices of lettings.....	416 12	.....	416 12
Rebuilding rail fence carried away by flood from Oil creek reservoir.....	209 00	.....	209 00
Total	\$166,496 66	\$111,321 00	\$277,817 66

Enlargement of Erie Canal.

Drafts and certificates of awards made by Canal Board and Appraisers.....	\$39,297 18	.....	\$39,297 18
Counsel fees for attorneys before Canal Board and Board of Canal Appraisers.....	500 00	.....	500 00
Total	\$39,797 18	.....	\$39,797 18

Construction Genesee Valley Canal.

Drafts and certificates for awards made by Canal Board and Appraisers.....	\$20,792 20	.....	\$20,792 20
Counsel fees for attorneys before Canal Board and Board of Canal Appraisers.....	105 00	.....	105 00
Total	\$20,897 20	.....	\$20,897 20

Repair Trust Fund.

Drafts to contractors for deposits on account of repair contracts, and interest accumulated on same (act chap. 116, Laws of 1868).....	\$18,508 54	.....	\$18,508 54
Total	\$18,508 54	.....	\$18,508 54

STATEMENT—(Continued).

SUMMARY.

NAME OF WORK OR EXPENDITURE MADE.	PAYMENTS.		Total.
	Amount paid during fiscal year.	Amount previously paid.	
General management.....	\$4,380 51	.....	\$4,380 51
Ordinary repairs, Erie canal.....	253,037 96	.....	253,037 96
Extraordinary repairs, Erie canal	247,714 98	\$56,748 50	304,468 48
Enlargement, Erie canal	39,797 18	.....	39,797 18
Ordinary repairs, Genesee Valley canal.....	223,390 65	48,490 00	271,870 65
Extraordinary repairs, Genesee Valley canal.....	166,496 66	111,331 00	277,817 66
Construction, Genesee Valley canal.....	20,897 20	.....	20,897 20
Repair Trust Fund.....	13,608 54	.....	13,608 54
Total	\$968,173 68	\$316,549 50	\$1,184,723 18

EXTRAORDINARY REPAIRS..

Authorized by act, chapter 715, Laws of 1868; act, chapter 877, Laws of 1869, and act, chapter 767, Laws of 1870.

The works which have been completed, authorized by said acts, and the present condition of those now in progress in pursuance thereof, may be stated about as follows:

ERIE CANAL.

WORK COMPLETED.

The work of dredging Ohio basin to obtain thirteen feet of water, and also the driving piles to protect the docking around the basin, and the deepening the slip connected therewith, was completed early the present summer.

The Pile Jetty pier at Black Rock, the extension of Black Rock pier, the raising and recoping a part of the old pier, and the removing a portion of the division bank at head of Black Rock harbor, and removing old warehouse foundation in the harbor, are substantially finished.

The improving about one-third of Main and Hamburg Street canal, by deepening and widening same, and constructing dock along Howard agricultural works, and at other points, is completed; as is also the improvement of the Clark and Skinner canal. Iron bridges have been constructed near Medina aqueduct; at Smith street, Brockport; on Pittsford road, east of Rochester; at Market street and Railroad avenue, Palmyra; on Fulton street, over Ohio Basin slip, at Buffalo, at Orangeport, Mabee's, McCarty's, on main road west of Lockport; an iron swing bridge on Exchange street, Rochester, and a timber road bridge over discharge from Cartersville waste-weir, and a tow-path change bridge near Macedon; Bridge abutments have been built at Brockport, Macedon, Palmyra, near Cartersville, at change bridge on section 367, and on Fulton street at Buffalo.

Iron needle beams have been inserted in bridges at Sodus and Glasgow streets in Clyde; Geneva, Church and Water streets in Lyons; Charles and Vienna streets in Newark; West avenue in Rochester; Main street, Brockport; at Hindsburgh; at Shelby street in Medina; at Millard's; at Adams and Comstock streets at Lockport, and at Washington street in Buffalo.

Vertical walls have been constructed at Middleport, Medina, Port Gibson and Albion.

A new towing-path and wall along Black Rock harbor, on construction section No 368, has been built.

An additional sluice from State ditch in Pendleton, and the extension of pier at head of combined locks at Lockport have been constructed.

GENESEE VALLEY CANAL.

The following described work is fully completed, although finals are not rendered in all cases :

Dam, bulk-head and feeder at foot of lock 101 ; rebuilding seven spans Ischua aqueduct ; Ischua reservoir ; raising Oil Creek reservoir ; protecting tow-path bank near lock 71 and bank of Genesee River feeder ; constructing channel from Genesee river to bulk-head of Murray Mill canal ; improving outlet to Rockville reservoir ; deepening culvert near lock No. 2 ; overflow spillway below Nunda ; rebuilding a portion of guard bank in town of Hume and iron bridges at Mount Morris ; State street, Olean ; at Blood's, near Portage ; Adams and Atkinson streets, Rochester, and over Griffin creek feeder at Cuba.

ERIE CANAL.

WORK IN PROGRESS.

The work of dredging channel around north end of Erie Basin breakwater ; constructing Georgia street iron bridge at Buffalo ; constructing the Hughes steam dredge ; constructing ditch to drain lands of Thomas McGuire and improving and protecting channel way and discharge culvert of Thomas' creek, are nearly completed.

For iron swing bridge at Albion and two iron bridges at Brockville and county line ; for receiver at White's creek ; vertical wall in Pendleton ; removing abutments and superstructure of old bridge and constructing new iron bridge over slip, leading to river lock at Tonawanda ; inserting iron needle beams in bridges at Ferry, Genesee, Prime and Michigan streets, Buffalo ; stop gate near Rochester ; improving canal at High clay bluff, west of Rochester, and waste-weir on three mile level in Brighton, the materials are delivered and the work will be completed the present winter.

A portion of the materials have been delivered for vertical walls at Shelby Basin, Reynale's Basin, Eagle Harbor and between 3d and 4th locks east of Rochester, and these works will be finished previous to opening of navigation next spring.

The additional sluice in town of Lockport is two-thirds completed; considerable material is delivered for raising guard lock at Sulphur Spring and for stop gate at Adams Basin.

Improving and completing Main and Hamburg Street canal is about one-fifth completed; removing old bench walls between Lyons and Lockville one-third done, and the deepening Erie canal from first lock east of Rochester to Lyell street more than one-half completed.

The work of improving and widening and constructing vertical walls in canal, between Erie and Commercial streets in Buffalo, has been commenced and will be completed next spring.

The work of doubling fourteen locks is in progress; a large amount of material is on hand, but not a large amount of masonry yet laid.

Work has not been commenced under the contracts for deepening and improving narrow canal at Black Rock; constructing vertical wall on Guard Lock section; extending and raising division bank at Black Rock; protecting canal against encroachments of Lake Erie, and improving and protecting discharge from Newark waste-weir.

By act, chapter 767, Laws of 1870, the sum of \$3,000 was appropriated for the purpose of opening channel for surplus waters from culvert and waste-weir on Erie canal, near Mabee's, in the town of Royalton, county of Niagara, on the express condition that all persons affected or damaged by the overflows, in consequence of such surplus waters, shall execute a good and sufficient release, etc., of all claims against the State in consequence of such overflows. The waste-weir discharges into east branch of eighteen-mile creek, which stream for some distance runs between moderately bluff banks; thence it passes in a sinuous course, with but little descent, through a smoother and less rolling section of country. By straightening the channel in places where required, and cleaning out and deepening other portions now choked and clogged with weeds, floodwood, etc., over a distance of six or seven miles, would undoubtedly afford the relief desired, but would be attended with a heavy outlay.

The engineers made an examination of the stream, with a view of determining whether the \$3,000 appropriated could be so used as to induce the persons claiming damages to execute the releases contemplated by the act; but they found that an expenditure of at least \$25,000 would be required to so improve the channel of the stream as to give the relief which the land-owners along its borders claim should be given to induce them to execute such releases; consequently, no further action has been taken under the law.

The engineers are of opinion that the damages alleged to have accrued from the waters discharged from the canal are greatly exaggerated, and that no relief should be granted without a thorough examination of the whole matter, and careful weighing of sworn statements before the Board of Canal Appraisers, or other competent authority for hearing and determining the same.

GENESEE VALLEY CANAL.

The deepening, widening and improving canal from junction to Rapids, and the clearing out channel of Beard's creek, below aqueduct, are two-thirds completed; securing slide-bank at Portage is five-sixths done, and the deepening summit level one-third completed.

WORKS RECOMMENDED AND THE ESTIMATED COST OF SAME, AND AMOUNT OF ADDITIONAL APPROPRIATIONS REQUIRED TO COMPLETE THOSE NOW UNDER CONTRACT.

The canal, from Erie street, in the city of Buffalo, to the head of Black Rock Harbor, is 150 feet wide, thence to a little below Ferry street, a distance of 5,700 feet, it is about seventy to eighty feet wide, when it enters the broad part of said harbor, which extends to the foot of the same at the dam at Lower Black Rock. The upper portion of the harbor, including the narrow canal along same, has a width of 260 feet, the lower portion is much broader. The water for supplying the canal as far east as Montezuma, 150 miles, and for supplying the several mills on the pier and at Lower Black Rock, passes through these channels, creating so strong a current through the narrow canal of the upper part of the harbor as to prove seriously detrimental to navigation.

The demands of these mills are inexorable and constant, and the amount of water used by them under a low head and badly constructed wheels is enormous. Their right under perpetual leases from the State to use the surplus waters of the harbor, resolves itself practically into the right to use all they want, regardless of the interests of the State, or the condition in which navigation is left in consequence.

There are two ways of remedying this difficulty. Discontinue the leases and cut off the water from the mills altogether, which would destroy the industrial interests that have grown up under, and are

dependent upon, such use for its sustenance, and pay the damages that would most likely be claimed consequent to such discontinuance, or make the canal through the harbor, by the construction of a division bank or wall entirely independent of same. The canal channel to be not less than 120 feet wide in any part thereof, through which only would be passed the feed water for the canal east, while through the channel outside of the canal would be passed the water for the mills, each separate and independent of the other. The estimated cost of constructing canal as above proposed, including a lock to connect with Scajaquada creek, is \$350,000.

Act, chapter 767, Laws of 1870, authorized the deepening and improving the narrow canal in said harbor, and appropriated \$80,000 for that purpose. The work has been let, but nothing has as yet been done. I would, therefore, recommend that an additional appropriation of \$80,000 be made therefor, so that the work done under said contract may be with reference to making the canal independent of the harbor, on the general plan, as above indicated.

The docking along the channel leading to Niagara river, below Ship Lock at Black Rock, is much decayed, and needs renewing. It is outside of the blue line. Its estimated cost is \$600.

In enlarging the canal at Tonawanda, a culvert at the "brick yard," so called, was taken up, and a covered drain with dry side walls and a plank covering constructed, parallel with the canal and about three hundred feet distant therefrom, leading thence to the State ditch, a distance of eighteen hundred feet. This drain answered the purposes at first, but has of late years, owing to dilapidation and obstructions, failed to afford the drainage required. The people of that locality desire a culvert constructed under the canal as the most effectual means of drainage, as it undoubtedly would be, of the low lands in that vicinity. The estimated cost of same is \$15,000.

To open the drain and cover the top with stone instead of plank, or insert thirty-inch cement pipe, which would be better, would answer temporarily the purpose of such drainage. The estimated cost is \$3,500.

The water discharged by the waste-weir at Newark falls into a small creek channel running through the village; and when water is discharged rapidly, as is the case two or three times during each season, it overflows the banks of the stream, filling cellars and otherwise damaging adjoining property. An appropriation of \$1,000 was made for the purpose of remedying this difficulty; but a further

examination and estimate of the cost of putting and securing the channel so as to prevent such overflow, shows that a further appropriation of \$2,000 will be required to accomplish the object, which the undersigned is of opinion should be made.

Act, chapter 281, Laws of 1869, authorized the construction of vertical walls on the berme side of the canal in the village of Macedon, at a cost of \$4,600; but as no money was provided, the work has not been done. I would recommend an appropriation for that purpose; also, one of \$800, to construct a permanent bridge over the State ditch at the foot of the bridge approach leading to New York Central depot at that place, and to reduce the grade of such approach, which is now too steep for convenience and safety.

The bottom of the canal through the rock cuts on construction sections Nos. 277, 278, 282, 283, 285 and 286, on the long level west of Rochester, was originally left too high, and should be reduced to improve navigation on said sections. The estimated cost of same is \$15,000.

The east abutment of the dam across the Genesee river at Mount Morris, was originally constructed of timber, which is now much decayed, and must be rebuilt to ensure the safety of the same, which is a large and important structure. I would recommend that it be rebuilt of stone corresponding in quality with the stone abutment at the west end of said dam. It is estimated to cost \$13,000.

To supply the deficiency of water on the upper two miles of the Dansville branch, the only portion of the Genesee Valley canal which is now deemed short of a supply, as stated in a previous part of this report, it is proposed to resort to the waters of Loon lake, as the cheapest and most accessible source, considering cost and damages. Its cost, as determined by a recent survey and estimate of the engineers, made for that purpose, will not exceed \$10,000.

For protecting the Genesee Valley canal against the encroachments of Genesee river, improving the same where required, and to pay for work now under contract, will require a further appropriation of \$12,000.

For changing plans of bridges and inserting iron needle beams in place of wood in iron bridges already constructed on this division, an appropriation of \$45,000 will be necessary.

SUMMARY OF APPROPRIATIONS RECOMMENDED.

Constructing division bank, widening, deepening, and otherwise improving narrow canal, in Black Rock harbor	\$80,000
Reconstructing docking along channel leading to Niagara river, below ship lock at Black rock	600
Constructing guard piers and protecting and securing swing-bridge at Ferry street, in Black Rock harbor	5,000
Constructing culvert under Erie canal at Tonawanda	15,000
Or a pipe sewer in lieu thereof	3,500
Constructing stop-gate at Holley	3,000
To pay for vertical wall at Macedon, authorized by act, chapter 281, Laws of 1869, and for constructing bridge across State ditch and improving grade of main road bridge approach, leading to New York Central depot, at that place	5,400
Deepening, improving and protecting channel leading from waste-weir at Newark	2,000
For reducing bottom of canal through rock cuts on construction sections Nos. 277, 278, 282, 283, 285 and 286, long level	15,000
For protecting canal against encroachments of Genesee river, constructing a stone abutment and docking at East end of dam across Genesee river at Mount Morris, securing the Dansville branch with a supply of water from Loon lake, completing work now under contract, and other improvements of the Genesee Valley canal	35,000
For changing plans of bridges on Western Division	45,000

TOLLS AND TONNAGE OF THE CANALS.

The amendment of the State Constitution in 1854, article 7, section 3, provides that "the rates of tolls on persons and property transported on the canals shall not be reduced below those for the year one thousand eight hundred and fifty-two, except by the Canal Board, with the concurrence of the Legislature."

At the urgent solicitation of the commercial interests of the State and the public, to quite an extent, the Canal Board recommended to the Legislature a reduction of tolls. In answer thereto, the Legislature, on the 9th and 13th of April, 1870, passed the following concurrent resolution :

Resolved (if the Senate concur), That the Legislature do concur in the recommendation of the Canal Board, and assent to the reduction of canal tolls to such an extent, not exceeding fifty per cent below the rates as prescribed by the toll sheet of eighteen hundred and fifty-two, as the Canal Board shall, in its discretion, think expedient,

and as the exigencies of trade shall demand during the ensuing season of navigation, and to change the same, from time to time, as circumstances shall, in the judgment of the board, require.

The Canal Board did, in pursuance of the authority conferred by said resolution of the Legislature, revise the toll sheet and reduce the rates, which reduction was equal to sixteen to twenty per cent on lumber, and about fifty per cent on most other articles. The argument used before the board was that such reduction was necessary to ensure business to the canals, and that it would add largely to their tonnage. The results of the past season's business has not, however, met the expectations of those most sanguine, nor has it reached the anticipations of those much less so.

The aggregate tonnage of the canals is a little in excess of that of 1869, while the reduced rates make the aggregate of tolls much less than those of that year. The foreign demand anticipated for our products, in consequence of the European war, did not occur. The high rates of ocean freights, consequent to the lack of competition which a respectable merchant marine of our own would have engendered, has been wanting. The uncertainty of the markets, together with a downward tendency of the same, has materially checked and stagnated commercial operations.

The movement has been more with reference to local demands for immediate use than to accumulations in quantities for a future market. The competition of the railroads as between themselves, and as to the canals incident to such competition, has also had its effect, and, in consequence of these and other causes, the business of the past season has not been as propitious as the friends of the canals had reason to hope.

The great west is a large consuming as well as a large producing region, and it perhaps is not yet determined whether the consuming population is not increasing faster in proportion than the producing. If so, are we not likely to be disappointed in the aggregate annual increase of the surplus products to come from that section?

The following statement shows the amount of flour and grain shipped by canal from Buffalo, in each year, during the last four years:

YEAR.	1867.	1868.	1869.	1870.
Flour, barrels.....	15,468	5,744	51,928	76,471
Wheat, bushels.....	10,109,718	10,860,060	16,363,480	16,737,718
Corn, bushels.....	14,931,812	15,999,136	7,816,960	5,911,668
Oats, bushels.....	9,419,686	10,428,504	8,983,046	5,572,254
Barley, bushels.....	1,306,733	204,218	82,429	841,024
Rye, bushels.....	736,578	688,899	76,792	878,323
Total grain bushels.....	36,404,527	37,640,817	38,892,707	39,431,881

The shipment of flour and grain from Buffalo this year is a little in excess of last, but largely short of the quantity shipped in 1867 and 1868. The large corn crop now held in the west, together with about the same amount of wheat and other grains as this year, will necessitate a large movement next season, and it is anticipated that the shipments thereof by canal will fully equal the aggregates of '67 and '68.

The movement of the greater bulk of the products of the forest will still be by the water lines, but that of flour and grain is controlled more by circumstances existing when shipped, as to its mode of transit, such as time, necessity, convenience and certainty, and, as a consequence, does not always go by the cheapest route.

The railroads have perfect running connections for freight between the Mississippi and sea-board, and have acquired an amount of rolling stock, the accumulations of the last five to six years, which enables them to compete with the water lines much more strongly now than at any previous time; and hence the necessity of low rates by the latter has become more imperative now than at any time heretofore.

The only way to meet this competition against our canals is to make them safe, sure and certain, as practicable, speedy as possible, and as cheap as shall be found compatible with due regard to the interests and obligations of the State, not only by levying comparatively low rates of tolls and maintaining an easy and unobstructed navigation, but by reducing the charges on the lakes, at the lake ports and other points, which go to swell the cost of transit by water. With these accomplished, may we not look forward to a brighter era for the future of our canals?

Now all routes leading from the valley of the Mississippi are open, and the rail is being extended to almost every hamlet and ramifying all parts of the country, making competition extremely strong when freights are scarce, and enough so at all times to warn us that cheap freights are the order of the day, and that our water lines must be so

managed that their efficiency and cheapness of transport will command a share, adequate to their importance and usefulness, as the regulators of the freight rates of transit of the internal commerce of a large section of our country.

Cheap freights will not only furnish cheap food to the million, which is a desideratum, but give additional employment to our population as carriers of the increased tonnage consequent to low rates of transit.

SOME SUGGESTIONS ON THE METHOD OF TOWING CANAL BOATS.

Since the inauguration of our canal system, forty-five years ago, the horse has been almost universally used for towing boats; attempts have been made from time to time to supersede him, but none have as yet proved quite successful. The average speed of loaded boats moved by horses has, during the past season, been a little over one and a half miles per hour, including time of locking at the locks.

The charges for towing have been from thirty to forty cents per mile.

A great point would be gained in the expense of moving boats and the saving of time, if the cost of towing could be reduced, and the speed accelerated to two and a quarter or two and a half miles per hour, which is deemed to be as high a rate of speed as would be found economical on a channel seventy feet wide by seven feet deep; and the question arises, how shall we adapt the means to attain the ends desired? If we have not inventive genius enough of our own, let us look abroad for its solution. The German system of cable towing by steam, if properly applied to our canals, is believed to be the cheapest and most practical plan yet devised, and one that seems to be well adapted to their use.

The following extract from a Frankfort-on-the-Main correspondent shows somewhat its application, adaptation to shoal streams, and the estimation in which it is held for purposes of such navigation where it has been tried and tested:

"The cable system of navigation is, at the present time, making rapid progress in Germany. This system prevails on the whole course of the Elbe, through the kingdom of Saxony, and to some extent in the neighborhood of Magdeburg, and its extension into the interior of Bohemia on the one hand, and to Hamburg on the other, is projected, and is expected to be completed in a short time.

On the Danube and its affluents the laying of a wire cable by the Danubian Steamship Navigation Company (Donau-Dampf-schiff fahrt-Gesellschaft) is being quickly and energetically prosecuted. The laying of one along the Rhine, near Bingen, has already been completed. It is also intended to make this fresh invention available for the smaller streams of Germany, as, for instance, on the Saale and the Unstrut, for which the civil engineer, Opel, of Maresburg, a little while ago, recommended the laying of a wire cable instead of the proposed construction of a towing-path. This system of cable navigation (either by ropes or chains) is likewise cheaper than the use of towing-paths, and by this method also the possessors of land and other property on the banks of rivers are spared many inconveniences and unpleasantries, which are otherwise unavoidable."

Opel has also shown the superiority which cable steamers possess over paddle-wheel steamers, since the former cause no ripple. The system has likewise an advantage in point of economy, since a steamer working on a chain or rope can make use of from ninety to ninety-four per cent of its steam power, while a paddle-wheel steamer can only use sixty per cent, and even, in case of a strong current, only thirty per cent. As a rule, says the Bearbeiter, the passenger boat with a forty-five horse-power engine must discontinue its voyage at high water, while a towing steamer, with a fourteen horse-power engine, holds the navigation open. The cable system of navigation can go on undisturbed, in general, so long as the sluices remain in good working order. While, on account of the inundation, etc., the towing-path is inaccessible; such hindrances, on the contrary, form no obstacle to the steamer on the cable; or, at most, it only requires somewhat more coal if the current be strong. The most important argument, however, in favor of the introduction of this system of navigation by means of a cable laid along the bed of the river, lies in the fact that a certain plan can be held; the failure of navigation lies principally in this, that the condition of the weather, or the negligence of the captain, may cause an unpunctual arrival of the cargo at its place of destination. The journey from Magdeburg to Hamburg, by means of the cable system, can be accomplished in three days, while now often four weeks are required. Tremendous as the difference is, it is, nevertheless, given as a fact by the above named paper. There are two difficulties which present obstacles to the introduction of this system on some streams; for instance, on the Rhone and Saone, in France, this method of river navigation is not

possible, because those rivers convey with them too great a quantity of sand, and thus clog up the cable. The other difficulty is the sharp bending of streams, as in the case of the Saale; but the impediment can be overcome to some extent by attaching few boats to the tugging steamer. The Bearbeiter makes the remark: "If we cannot succeed so far as to see thirty boats dragged one after the other on the Saale, as on the Seine, we must, for the present, be satisfied to transport three or four." On the Oder, also, this system is about to be adopted; but this river has, in one place, only a depth of fifteen inches; and it is, therefore, necessary to build the vessel according to the nature of the stream. On the Elbe, with from seventeen to eighteen inches of depth, it succeeds well, and the investment has realized from nine to twelve per cent. In the Saale, at low water, there is a depth of twenty-eight inches, which, however, soon deepens to from thirty-six to forty inches, which is a circumstance much in favor of the above system.

The Legislature, by an act passed May 2, 1870, granted to Addison M. Farwell, his associates and successors, permission to organize a corporation under the "general law," to introduce upon the canals of this State the "European system" of steam towing by submerged chains or cables, and allowed them eighteen months from the date of passage of the law, in which to introduce the system; but if they failed or neglected to do so within that time, the rights granted under the act were to cease. The undersigned is not aware that the grantee has taken any action in the matter.

It is important that something should be done under the said law, or such action taken by the State as will induce tests of the application of that or some other system to be made.

I would suggest that an appropriation of \$20,000 be made for the purpose of testing and determining, under a suitable commission appointed for that purpose, the cheapest and best method of steam towing on the canals of this State, in order that a cheaper and more expeditious method of moving canal boats may, if possible, be arrived at than that of towing by horses.

THE TIME NOW CONSUMED IN PASSING THE LOCKS
SHOULD BE LESSENED.

The capacity of a canal, with an unobstructed channel and a sufficient supply of water, may be measured by the number of lockages which can be made daily and maintained through the navigable season. This capacity can be increased by the use of such facilities as will shorten the time of lockings. Heath's plan of tumble-gate at the head of the locks, where the same has been inserted, has proved to be an element in that direction; also his or such other plan for utilizing the water passing from the upper to the lower level to open and close the lower gates, and haul boats in and out of the locks, would be another element in the saving of time, much desired if not absolutely needed in connection with such system of steam towing, as may be found the most practicable and best adapted to our canals in shortening the time of passage and cheapening the cost of transportation.

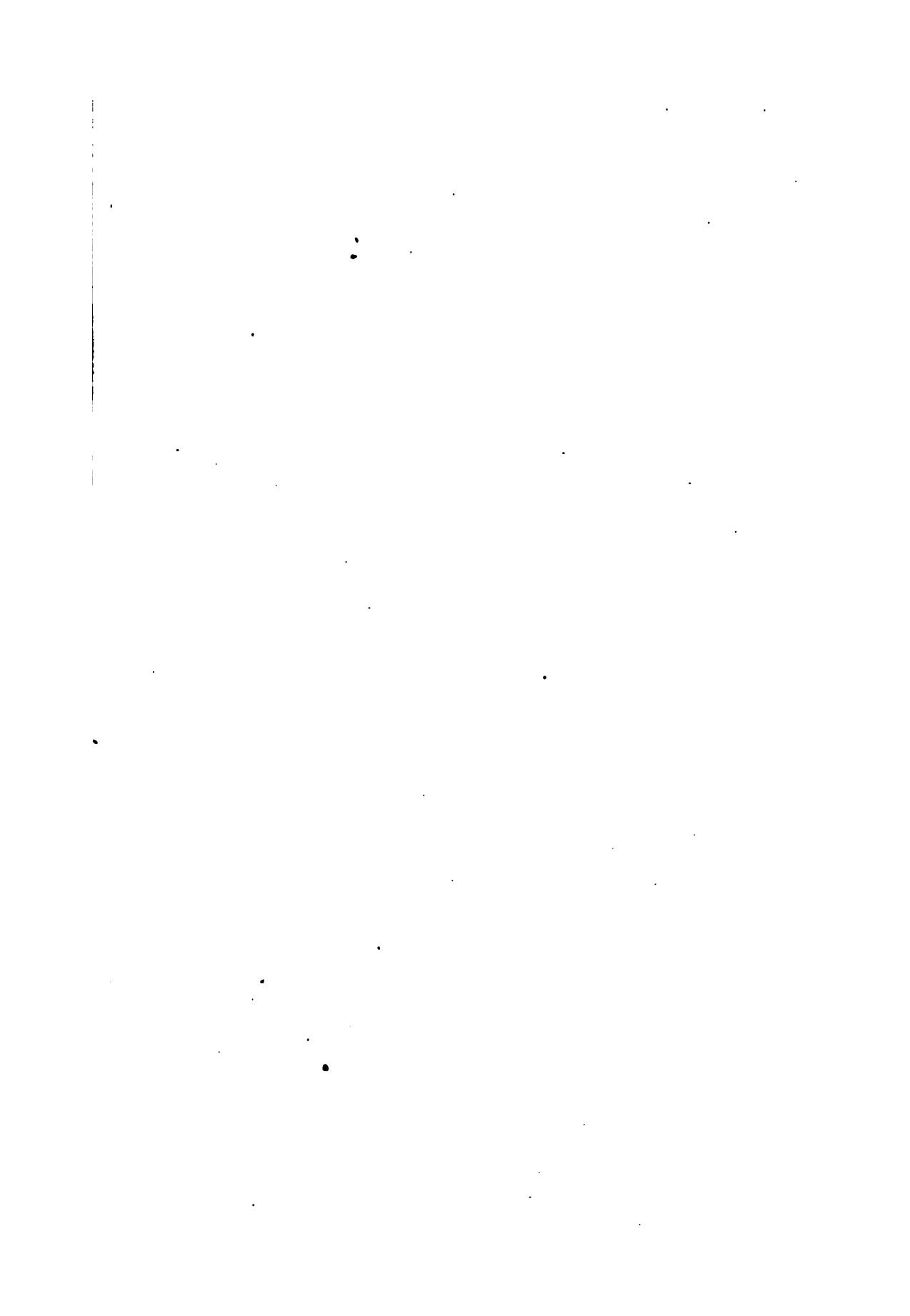
Respectfully submitted.

JOHN D. FAY,

Canal Commissioner.

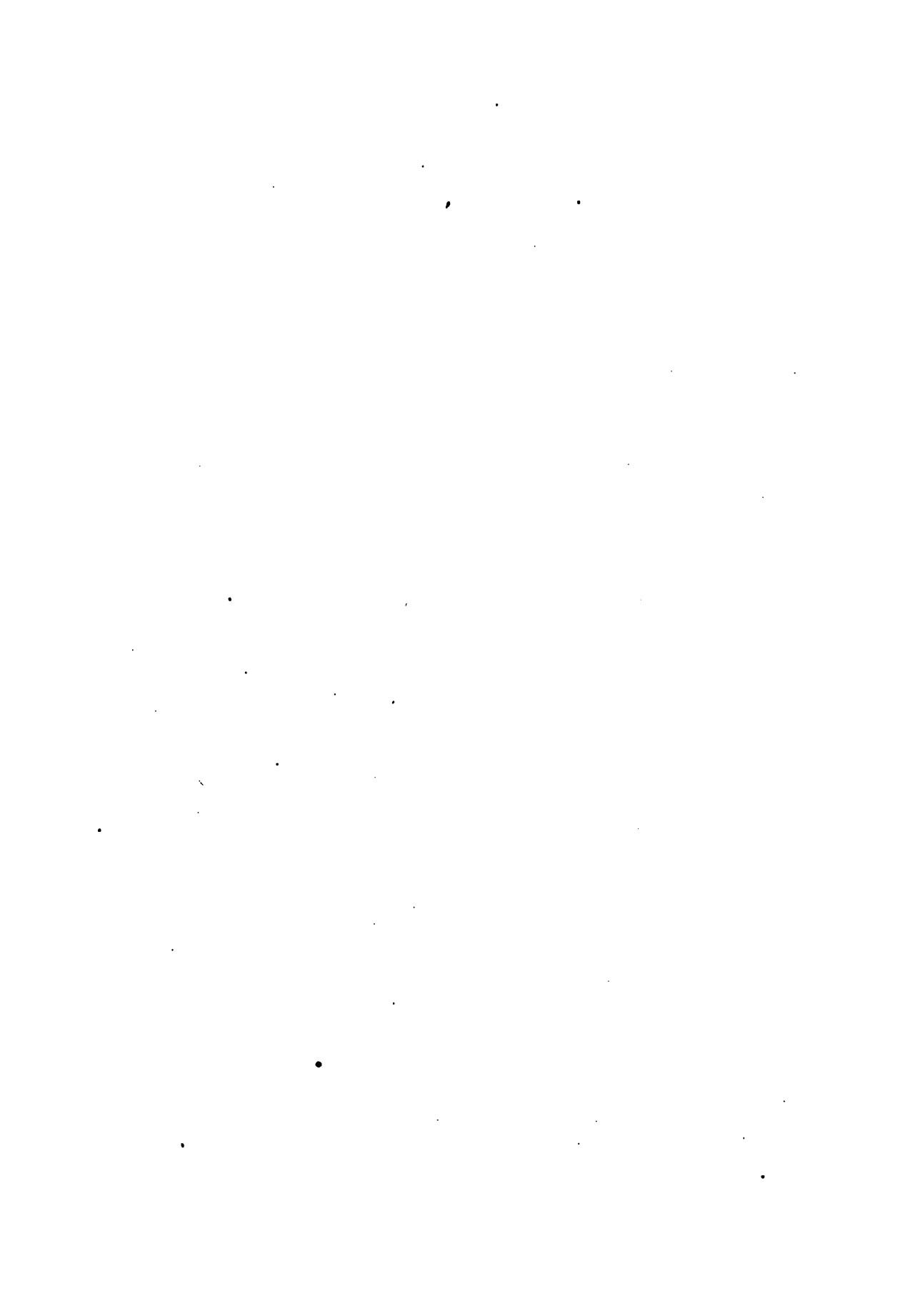
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14



T A B L E S

ACCOMPANYING THE ANNUAL REPORT OF THE
CANAL COMMISSIONERS.



The following is a Schedule of all the Repair Contracts now remaining in force let in pursuance of act, chap. 105, Laws of 1857, to the present time, and shows the commencement of the several terms, the canal or section embraced in the contracts, the duration of each term, the annual compensation to the contractor, and the several amounts of cash deposited as security for the performance of the contracts, and the name of the contractor or contractors. (The Repair Contracts for the other sections have been surrendered under chap. 55, Laws 1870.)

Commencement of term.	Canal and section.	Duration of term.	Annual compensation.	Cash security.	Name of contractor.	Residence.	Remarks.
January 1, 1868	Erie, No. 1	5 years	\$70,000	\$4,000	W. C. Stephens	Fulton	Expires January 1, 1872.
March 1, 1869	Erie, No. 8	4-10-12 years	18,000	4,000	A. G. Fish	Fulton	Expires January 1, 1874.
January 1, 1867	Erie, No. 10	5 years	34,000	4,000	Benjamin Butler	Rochester	Expires January 1, 1872.
March 9, 1867	Erie, No. 11	4 yrs. 9 mos. 22 ds.	43,500	4,000	V. P. Whitmore	Rochester	Expires January 1, 1872.
March 1, 1868	Erie, No. 14	4-10-12 years	44,400	4,000	George D. Lord	Rochester	Expires January 1, 1873.
January 1, 1868	Chenango, No. 2	5 years	9,970	4,000	John Hull	Binghamton	Expires January 1, 1873.
January 1, 1867	Oswego, No. 1	5 years	18,500	4,000	George Corkins	Salina	Expires January 1, 1872.
March 1, 1869	Oswego, No. 2	4-10-12 years	28,400	4,000	A. Cadwell Beldin	Geddes	Expires January 1, 1874.
March 1, 1869	Crooked L., No. 1	4-10-12 years	7,750	4,000	O. C. Knapp	Penn Yan	Expires January 1, 1874.
January 1, 1867	Chemung and feeder No. 1	5 years	36,000	4,000	John Leahy	Rochester	Expires January 1, 1872.

ANNUAL REPORT OF THE

REPAIR CONTRACTS.

COMMITTEE MENT OF CONTRACTS.	Canal and section.	Duration of contract.	SECURITY.		Names of contractors.	Residence of contractors.	Names of attorneys and assignees.	Residence of attorneys and assignees.	Contract expires.
			U. S. bonds to Court of Common Law etc., ch. 57, et seq. 1867.	Annual compen- sation.					
Jan. 1, 1867..	Erie, No. 1.....	5 years.....	\$70,000	\$4,000	Wm. C. Stephens... A. G. Fish....	Fulton.....	Thomas Gale.....	Salinia.....	Jan. 1, 1872
March 1, 1869..	Erie, No. 8.....	4.10-12 years...	18,000	4,000	4,000	Fulton.....	Wm. Madgett.....	Wm. Madgett.....	Jan. 1, 1874
Jan. 1, 1867..	Erie, No. 10.....	5 years.....	34,000	4,000	4,000	Benjamin Butler.....	Rochester.....	Rochester.....	Jan. 1, 1872
March 9, 1867..	Erie, No. 11.....	4 Y. 9 m. 22 d...	43,500	4,000	4,000	Val. F. Whitmore.....	Rochester.....	Rochester.....	Jan. 1, 1872
March 1, 1868..	Erie, No. 14.....	4.10-12 years...	44,400	4,000	4,000	Geo. D. Lord.....	Binghamton.....	Binghamton.....	Jan. 1, 1873
Jan. 1, 1869..	Chenango, No. 9.....	5 years.....	6,970	4,000	6,000	John Hull.....	Salina.....	Mead Belden.....	Salina.....
Jan. 1, 1867..	Oswego, No. 1.....	6 years.....	18,500	4,000	4,000	George Corkins.....	Geddes.....	Geddes.....	Jan. 1, 1873
March 1, 1869..	Oswego, No. 2.....	4 Y. 10 m...	28,400	4,000	6,000	A. C. Belden.....	Penn Yan.....	Penn Yan.....	Jan. 1, 1874
March 1, 1869..	Crooked Lake.....	4.10-12 years...	7,750	4,000	6,000	O. C. Knapp.....	Rochester.....	Rochester.....	Jan. 1, 1874
Jan. 1, 1867..	Clemming and Feeder.	5 years.....	36,000	4,000	4,000	John Leahy.....	Jarvis Lord.....	Pittsford.....	Jan. 1, 1872

REPAIR CONTRACTS.

COMMENCEMENT OF CONTRACT.	Canal and section.	Duration of contract.	Annual compensation.	Fifteen per cent of one-twelfth annual compensation retained.	Monthly dues.	One-twelfth amount of schedule.	Monthly dues one-twelfth amount of schedule.
JANUARY 1, 1867.....	Erie, No. 1.....	5 years.....	\$70,000	\$5,833 33	\$516 00	\$4,988 33	.....
March 1, 1869.....	Erie, No. 6.....	4 years 10 months.....	18,000	1,600 00	225	1,276 00	.....
March 1, 1867.....	Erie, No. 10.....	5 years.....	84,000	2,883 33	425	2,408 33	.....
January 1, 1867.....	Erie, No. 11.....	4 yrs. 9 mos. 22 days.....	48,500	3,625 00	643 75	3,061 25	.....
March 9, 1868.....	Erie, No. 14.....	4 years 10 months.....	44,400	3,700 00	555 00	3,146 00	.....
January 1, 1868.....	Chenango, No. 2.....	5 years.....	9,970	890 88	124	706 21	.....
January 1, 1867.....	Oswego, No. 1.....	4 years 10 months.....	18,500	1,541 66	231	1,810 41	.....
March 1, 1869.....	Oswego, No. 2.....	4 years 10 months.....	26,400	2,380 66	385 00	2,014 66	.....
March 1, 1869.....	Crooked Lake.....	4 years 10 months.....	17,750	645 88	867	558 96	.....
January 1, 1867.....	Chemung and Feeder.	6 years.....	38,000	3,000 00	450 00	2,850 00	.....

Repair Contracts—(Continued).

COMMENCEMENT OF CONTRACT.	Canal and section.	Fifteen per cent retained due annually.	Names of contractors.	Residence of contractor.	Names of assignees.	Residence of assignee.	Contract surrendered or abandoned.	Contract expires.
JANUARY 1, 1867.....	Erie, No. 1.....	\$10,500 00	William C. Stephens	Fulton.....	Thomas Gale.....	Salina.....	.....	January 1, 1872.
March 1, 1869.....	Erie, No. 8.....	2,700 00	Aaron G. Fish	Fulton.....	Wm. Knigett.....	Rochester.....	.....	January 1, 1874.
January 1, 1867.....	Erie, No. 10.....	5,100 00	Benjamin Butler	Rochester.....	.....	.....	.....	January 1, 1872.
March 9, 1867.....	Erie, No. 11.....	6,525 00	V. P. Whitmores	Rochester.....	.....	.....	.....	January 1, 1872.
March 1, 1868.....	Erie, No. 14.....	6,050 00	George D. Lord	Rochester.....	.....	.....	.....	January 1, 1870.
January 1, 1868.....	Chenango, No. 2.....	1,435 50	John Hull.....	Binghamton.....	.....	.....	.....	January 1, 1873.
January 1, 1867.....	Oswego, No. 1.....	2,775 00	George Corkins	Salina.....	Mead Baldwin.....	Geddes.....	.....	January 1, 1872.
March 1, 1869.....	Oswego, No. 2.....	4,260 00	A. C. Beiden	Geddes.....	Penn Yan.....	.....	.....	January 1, 1874.
March 1, 1869.....	Crooked Lake.....	1,163 50	Oliver C. Knapp	Rochester.....	John Lehey.....	Rochester.....	January 1, 1874.
January 1, 1867.....	Chemung and Feeder.	5,400 00	January 1, 1872.

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The following is a Schedule of Repair Contracts, with the percentage allowed in pursuance of Act, chapter 262, Laws of 1864.

Commencement of term.	Canal and section.	Duration of term.	Original annual compensation.	Percentage allowed	Annual compensation, including percentage.	Name of contractor.	Expires.
March 4, 1863..	Erie, No. 1.....	3½ years.....	\$30,900 00	7%	\$38,628 00	Spencer Jackson.....	January 1, 1867
March 4, 1863..	do 2.....	3 yrs. 365 days.....	14,500 00	6½	16,644	Lewis Seelye.....	August 1, 1864
May 1, 1863..	do 4.....	4% year.....	12,700 00	6½	14,864	Hosch & Lowell.....	August 1, 1864
March 4, 1863..	do 5.....	4½ year.....	4,483 00	70	5,000	Philip Corking.....	August 1, 1864
May 1, 1863..	do 6.....	5 years.....	3,480 00	63	5,638 50	Thomas Gale.....	Sept. 28, 1864
Nov. 1, 1863..	do 7.....	4½ years.....	4,940 00	60	5,700	Chas. Nichols.....	May 1, 1866
May 1, 1861..	do 8.....	4½ years.....	7,000 00	61	11,270 00	Chas. J. Hayden.....	May 1, 1867
May 1, 1861..	do 9.....	5 years.....	7,000 00	61	11,270 00	Chester B. Thomas.....	January 1, 1867
March 4, 1863..	do 10.....	3 yrs. 365 days.....	11,500 00	63	14,875 50	Byron J. Hanks.....	January 1, 1867
May 1, 1863..	do 11.....	4½ years.....	11,500 00	63	14,040 50	Edward A. Mills.....	October 1, 1867
April 1, 1863..	do 12.....	4½ years.....	6,700 00	51	10,117 00	Francis Hitchcough.....	August 1, 1864
March 15, 1861..	do 13.....	5 years.....	6,800 00	70	8,240	Archibald McArthur.....	August 1, 1864
March 14, 1863..	do 14.....	8½-13 years.....	14,400 00	70	25,560	James Bellows	January 1, 1867
April 1, 1863..	Chemung, No. 1.....	4½ years.....	16,900 00	60	20,950 00	A. Peak & Co.....	May 1, 1866
May 1, 1861..	Chenango, No. 1.....	5 years.....	18,900 00	50	20,950 00	John P. Smith.....	May 1, 1866
Oct. 1, 1860..	do 2.....	5 years.....	5,600 00	50	6,720	John Smith.....	January 1, 1867
May 1, 1861..	do 3.....	5 years.....	7,000 00	53	10,710 50	John Smith.....	January 1, 1867
May 1, 1863..	Owego, No. 1.....	4½ year.....	5,000 00	55	12,150 00	Wm. Avery.....	March 30, 1865
May 1, 1863..	do 2.....	4½ year.....	11,900 00	41	17,860 00	Chas. E. Case.....	January 1, 1867
July 1, 1863..	Cayuga and Seneca, No. 1.....	4½ year.....	9,900 00	41	14,080 00	George M. Case.....	October 1, 1865
Oct. 1, 1860..	Crooked Lake, No. 1.....	5 years.....	8,389 00	55	10,900 00	H. W. Randall	August 1, 1864
Feb. 1, 1863..	Genesee Valley, No. 1.....	5 years.....	8,472 00	60	10,564	Wm. McArthur.....	August 15, 1864
March 15, 1861..	do 2.....	5 years.....	12,640 00	60	15,140	John Lambert.....	August 1, 1865
Aug. 1, 1860..	do 3.....	5 years.....	7,453 00	53	11,146 50	Wm. McArthur.....	August 1, 1864
Oct. 1, 1863..	Champlain, No. 1.....	4½ years.....	12,968 00	68	16,136	Archibald McArthur.....	August 1, 1864
Aug. 1, 1860..	do 2.....	6 years.....	5,300 00	80	7,900	Anson Bang	August 1, 1864
Aug. 1, 1863..	do 3.....	3½-13 years.....	7,500 00	60	12,000 00	H. D. Denison	January 1, 1866
May 1, 1861..	Black River, No. 1.....	4½ years.....	8,700 00	50	12,050 00	Edward H. Edwards	March 1, 1866
March 1, 1861..	do 2.....	6 years.....	4,178 00	50	6,267 00	Paul F. Maxon	May 1, 1866
Nov. 1, 1859..	do 3.....	5 years.....	2,900 00	50	5,700 00	Ward & McVicker	Nov. 1, 1864

STATEMENT showing amounts expended by superintendents of repairs and paid repair contractors, and average cost per mile on each and all canals, from 1827 to 1870, inclusive.

YEARS.	ERIE AND CHAMPLAIN CANALS.			OSWEGO CANAL.			CAYUGA AND SENECA CANAL.			CHEMUNG CANAL.		
	Cost of repairs.	Average per mile.	Cost of repairs.	Average per mile.	Cost of repairs.	Average per mile.	Cost of repairs.	Average per mile.	Cost of repairs.	Average per mile.	Cost of repairs.	Average per mile.
1827.....	\$282,472	.....	\$282,472	.....	\$282,472	.....	\$282,472	.....	\$282,472	.....	\$282,472	.....
1828.....	225,546	513	225,546	513	225,546	513	225,546	513	225,546	513	225,546	513
1829.....	231,381	539	231,381	539	231,381	539	231,381	539	231,381	539	231,381	539
1830.....	203,968	401	203,968	401	203,968	401	203,968	401	203,968	401	203,968	401
1831.....	168,240	383	168,240	383	168,240	383	168,240	383	168,240	383	168,240	383
1832.....	327,302	748	327,302	748	327,302	748	327,302	748	327,302	748	327,302	748
1833.....	328,585	746	328,585	746	328,585	746	328,585	746	328,585	746	328,585	746
1834.....	490,459	975	490,459	975	490,459	975	490,459	975	490,459	975	490,459	975
1835.....	382,921	863	382,921	863	382,921	863	382,921	863	382,921	863	382,921	863
1836.....	310,183	704	310,183	704	310,183	704	310,183	704	310,183	704	310,183	704
1837.....	360,406	820	360,406	820	360,406	820	360,406	820	360,406	820	360,406	820
1838.....	374,713	851	374,713	851	374,713	851	374,713	851	374,713	851	374,713	851
1839.....	297,722	676	297,722	676	297,722	676	297,722	676	297,722	676	297,722	676
1840.....	364,363	827	364,363	827	364,363	827	364,363	827	364,363	827	364,363	827
1841.....	255,857	581	255,857	581	255,857	581	255,857	581	255,857	581	255,857	581
1842.....	329,554	732	329,554	732	329,554	732	329,554	732	329,554	732	329,554	732
1843.....	507,614	676	507,614	676	507,614	676	507,614	676	507,614	676	507,614	676
1844.....	371,449	844	371,449	844	371,449	844	371,449	844	371,449	844	371,449	844
1845.....	399,094	907	399,094	907	399,094	907	399,094	907	399,094	907	399,094	907
1846.....	371,185	843	371,185	843	371,185	843	371,185	843	371,185	843	371,185	843
1847.....	380,388	894	380,388	894	380,388	894	380,388	894	380,388	894	380,388	894
1848.....	509,453	1,145	509,453	1,145	509,453	1,145	509,453	1,145	509,453	1,145	509,453	1,145
1849.....	386,681	869	386,681	869	386,681	869	386,681	869	386,681	869	386,681	869
1850.....	476,887	1,085	476,887	1,085	476,887	1,085	476,887	1,085	476,887	1,085	476,887	1,085
1851.....	457,458	973	457,458	973	457,458	973	457,458	973	457,458	973	457,458	973
1852.....	568,839	1,239	568,839	1,239	568,839	1,239	568,839	1,239	568,839	1,239	568,839	1,239
1853.....	576,777	1,271	576,777	1,271	576,777	1,271	576,777	1,271	576,777	1,271	576,777	1,271
1854.....	677,370	1,543	677,370	1,543	677,370	1,543	677,370	1,543	677,370	1,543	677,370	1,543
1855.....	505,608	1,154	505,608	1,154	505,608	1,154	505,608	1,154	505,608	1,154	505,608	1,154
1856.....	454,965	1,031	454,965	1,031	454,965	1,031	454,965	1,031	454,965	1,031	454,965	1,031
1857.....	455,742	1,035	455,742	1,035	455,742	1,035	455,742	1,035	455,742	1,035	455,742	1,035
1858.....	453,916	973	453,916	973	453,916	973	453,916	973	453,916	973	453,916	973
1859.....	446,746	989	446,746	989	446,746	989	446,746	989	446,746	989	446,746	989
1860.....	326,006	526	326,006	526	326,006	526	326,006	526	326,006	526	326,006	526
1861.....	206,952	476	206,952	476	206,952	476	206,952	476	206,952	476	206,952	476
1862.....	340,650	533	340,650	533	340,650	533	340,650	533	340,650	533	340,650	533
1863.....	323,625	744	323,625	744	323,625	744	323,625	744	323,625	744	323,625	744
1864.....	519,635	1,194	519,635	1,194	519,635	1,194	519,635	1,194	519,635	1,194	519,635	1,194
1865.....	816,660	1,877	816,660	1,877	816,660	1,877	816,660	1,877	816,660	1,877	816,660	1,877
1866.....	665,168	1,529	665,168	1,529	665,168	1,529	665,168	1,529	665,168	1,529	665,168	1,529
1867.....	488,170	1,125	488,170	1,125	488,170	1,125	488,170	1,125	488,170	1,125	488,170	1,125
1868.....	443,677	1,020	443,677	1,020	443,677	1,020	443,677	1,020	443,677	1,020	443,677	1,020
1869.....	605,296	1,401	605,296	1,401	605,296	1,401	605,296	1,401	605,296	1,401	605,296	1,401
1870.....	1,084,378	2,493	1,084,378	2,493	1,084,378	2,493	1,084,378	2,493	1,084,378	2,493	1,084,378	2,493

Statement of superintendents' expenditure — (Continued).

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Add payments on account of repairs by the Canal Commissioners, exclusive of payments to contractors for repairs, viz.:

By Oliver Bascom, Erie canal.....	\$22,128 33
Geo. W. Chapman, Erie canal.....	84,101 57
Stephen T. Hart, Erie canal.....	5,330 08
Wm. W. Wright, Erie canal.....	12,461 11
John D. Fay, Erie canal.....	56,474 04
Oliver Bascom, Champlain canal.....	\$27,264 00
Geo. W. Chapman, Champlain canal.....	59,021 60
Stephen T. Hart, Oswego canal.....	\$7,349 50
Wm. W. Wright, Oswego canal.....	7,068 96
Wm. W. Wright, Cayuga and Seneca canal.....	14,418 46
Stephen T. Hart, Chenango canal.....	\$150 10
Wm. W. Wright, Chenango canal.....	28,817 86
Stephen T. Hart, Chenango canal.....	\$1,677 35
Wm. W. Wright, Chenango canal.....	64,302 49
Oliver Bascom, Black River canal.....	\$1,012 00
Geo. W. Chapman, Black River canal.....	28,387 08
John D. Fay, Genesee Valley canal.....	24,360 08
	17,828 40
	\$415,455 37

Total amount expended for ordinary repairs from 1st October, 1869, to 30th September, 1870

Add payments on account of extraordinary repairs by Canal Commissioners, viz.:

By Oliver Bascom and George W. Chapman, Eastern Division.....	\$347,158 09
Stephen T. Hart and W. W. Wright, Middle Division.....	830,405 06
John D. Fay, Western Division	430,714 25
	1,158,273 30
Total amount expended for ordinary and extraordinary repairs from 1st October, 1869, to 30th September, 1870	\$2,293,091 17
	3,629 18

TABLE

Exhibiting the date of the opening and the closing of the Hudson river, and the number of days open; also the time of commencement and close of each navigable season of canals, and the number of days of navigation since 1824; also the date of the opening of Lake Erie since 1827.

River open.	River closed.	COMMENCEMENT AND CLOSE OF NAVIGATION OF ERIC CANAL.		Canal closed.	Navigable days.	Opening of the lake.
		Days open.	Canal open.			
March 3, 1824.....	January 5, 1824.....	309	April 80, 1824.....	December 4.....	219	
March 6, 1825.....	December 18, 1825.....	302	April 12, 1825.....	December 5.....	288	
February 25, 1826.....	December 13, 1826.....	302	April 12, 1826.....	December 5.....	288	
March 26, 1827.....	November 26, 1827.....	251	April 22, 1827.....	December 18.....	243	
February 6, 1828.....	December 22, 1828.....	220	March 21, 1828.....	December 18.....	243	April 21, 1827
April 1, 1829.....	January 14, 1829.....	286	May 4, 1829.....	December 20.....	238	April 1, 1828
March 15, 1830.....	December 20, 1830.....	283	April 20, 1830.....	December 17.....	230	May 10, 1829
March 15, 1831.....	December 6, 1831.....	283	April 16, 1831.....	December 17.....	232	May 6, 1830
March 26, 1832.....	December 21, 1832.....	280	April 25, 1832.....	December 1.....	230	May 8, 1831
March 21, 1833.....	December 18, 1833.....	271	April 19, 1833.....	December 21.....	241	April 27, 1832
February 17, 1834.....	December 15, 1834.....	291	April 17, 1834.....	December 12.....	238	April 23, 1833
March 26, 1835.....	November 30, 1835.....	216	April 15, 1835.....	December 13.....	240	April 1, 1834
April 4, 1836.....	December 7, 1836.....	244	April 20, 1836.....	November 30.....	260	May 8, 1835
March 27, 1837.....	December 14, 1837.....	261	April 16, 1837.....	November 26.....	274	April 27, 1836
March 19, 1838.....	November 26, 1838.....	257	April 12, 1838.....	December 9.....	264	May 16, 1837
March 26, 1839.....	November 18, 1839.....	286	April 20, 1839.....	November 26.....	298	March 31, 1838
February 25, 1840.....	November 5, 1840.....	285	April 19, 1840.....	December 16.....	241	April 11, 1839
March 24, 1841.....	November 19, 1841.....	286	April 24, 1841.....	December 9.....	286	April 27, 1839
February 24, 1842.....	November 22, 1842.....	308	April 20, 1842.....	November 30.....	291	April 14, 1840
March 18, 1843.....	December 10, 1843.....	243	May 1, 1843.....	December 5.....	292	March 7, 1841
March 18, 1844.....	December 11, 1844.....	278	April 18, 1844.....	November 30.....	314	May 6, 1843
February 24, 1845.....	December 3, 1845.....	283	April 16, 1845.....	November 26.....	223	March 14, 1844
March 18, 1846.....	December 14, 1846.....	275	April 16, 1846.....	November 25.....	328	April 8, 1845
April 7, 1847.....	December 25, 1847.....	243	May 1, 1847.....	November 30.....	294	April 11, 1846
March 28, 1848.....	December 27, 1848.....	282	May 1, 1848.....	December 9.....	314	April 28, 1847
February 17, 1849.....	December 26, 1849.....	286	May 1, 1849.....	December 5.....	283	April 9, 1848
March 10, 1850.....	December 17, 1850.....	293	April 22, 1850.....	December 11.....	319	March 26, 1849
February 26, 1851.....	December 14, 1851.....	288	April 15, 1851.....	December 5.....	324	March 25, 1850
March 28, 1852.....	December 21, 1852.....	270	April 20, 1852.....	December 16.....	325	April 2, 1851
March 28, 1853.....	December 18, 1853.....	274	April 20, 1853.....	December 20.....	329	April 20, 1852
March 27, 1854.....	December 8, 1854.....	286	May 1, 1854.....	December 8.....	345	April 14, 1853
March 27, 1855.....	December 20, 1855.....	288	May 1, 1855.....	December 10.....	324	April 26, 1854
April 11, 1856.....	December 14, 1856.....	248	May 5, 1856.....	December 4.....	324	April 21, 1855
February 27, 1857.....	December 27, 1857.....	303	May 6, 1857.....	December 15.....	223	May 2, 1856

Table exhibiting the date of the opening and closing of the Hudson River, &c.—(Continued).

OPENING AND CLOSING OF THE HUDSON RIVER.		COMMENCEMENT AND CLOSE OF NAVIGATION OF ERIE CANAL.			
River open.	River closed.	Days open.	Canal open.	Canal closed.	Navigable days.
March 30, 1858	December 17, 1858	273	April 28, 1858	December 8	225 April 15, 1858
March 13, 1859	December 10, 1859	273	April 15, 1859	December 12	242 April 7, 1859
March 6, 1860	December 14, 1860	283	April 25, 1860	December 12	242 April 17, 1860
March 5, 1861	December 23, 1861	294	May 1, 1861	December 10	224 April 18, 1861
April 3, 1862	December 19, 1862	259	May 1, 1862	December 10	224 April 15, 1862
April 3, 1863	December 11, 1863	263	May 1, 1863	December 9	223 April 15, 1863
March 22, 1864	December 12, 1864	277	April 30, 1864	December 8	223 April 13, 1864
March 20, 1865	December 16, 1865	270	May 1, 1865	December 13	226 April 26, 1865
March 20, 1866	December 15, 1866	270	May 1, 1866	December 12	226 April 28, 1866
March 26, 1867	December 8, 1867	257	May 6, 1867	December 30	259 April 21, 1867
March 24, 1868	December 5, 1868	263	May 4, 1868	December 7	217 April 19, 1868
April 6, 1869	December 6, 1869	248	May 6, 1869	December 10	218 May 1, 1869
March 31, 1870	December 17, 1870	261	May 10, 1870	December 8	213 April 16, 1870

The Genesee Valley canal was opened on the 13th day of May, 1867. All the canals except the Erie were closed on the 12th day of December, 1867.

In consequence of the damages done by the freshet of the spring of 1869 to the Eastern Division of the canals, the time for opening the canals for navigation on said division was extended to May 10, 1869:

On the 7th day of December, 1870, the board passed the following resolution:
Resolved, That the time for closing the Erie canal on the Middle and Eastern Divisions be extended to the 10th inst., and on the Champlain canal until the 15th inst., unless the same shall sooner be closed by ice.

SCHEDULE of contracts let by Board of Canal Commissioners under Acts, chap. 327, Laws of 1854, and chap. 554, Laws of 1855, showing the commencement of the several terms the canal or section embraced in the contract, the duration of each term, and the annual compensation to the contractors.

Commencement of term.	Canal Section.	Duration of term.	Annual compensation.	Remarks.
October 1, 1854.....	Section 8, Erie canal.....	Five years.	\$7,870	Expired October 1, 1860.
March 1, 1855.....	Section 1, Erie canal.....	do	48,000	Expired March 4, 1860.
October 1, 1855.....	Section 1, Chenango canal.....	do	14,700	Expired October 1, 1860.
October 1, 1855.....	Section 2, Chenango canal.....	do	6,000	Expired October 1, 1860.
October 1, 1855.....	Oneida Lake canal.....	do	3,975	Expired October 1, 1860.
January 1, 1856.....	Crooked Lake canal.....	do	4,473	Expired October 1, 1860.
January 1, 1856.....	Section 1, Black River canal.....	do	3,939	Expired January 1, 1861.
January 1, 1856.....	Section 2, Black River canal.....	do	9,985	Expired January 1, 1861.
April 15, 1856.....	Addition to section 2, Black river canal, chap. 185, Laws of 1856.....	.....	2,000	Expired January 1, 1861.
February 1, 1856.....	Section 2, Genesee Valley canal.....	Five years.	18,900	Expired February 1, 1861.

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STATEMENT of the number, class and tonnage of boats on the canals on the 1st of January, 1844; also the number, class and tonnage of boats built and registered in each year, subsequently to, and including 1862.

[Assem. No. 6.]

Statement—(Continued).

TONS.	1848.		1849.		1850.		1851.		1852.	
	Number.	Tons.								
800										
260										
240										
260										
220										
210										
200										
195										
190										
180										
175										
170										
160										
160										
145										
140										
135										
130										
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40										
35										
30										
25										
20										
15										
10										
900	4	4	6	6	18	1,308	27	2,700	34	8,400
1,780	18	16	26	26	570	250	83	1,180	62	5,985
11,340	78	1,105	15	1,360	11	73	6,480	92	6,480	1,370
11,360	75	6,260	38	6,040	36	83	2,260	36	2,060	1,060
4,180	75	5,635	17	5,775	23	78	1,650	10	700	680
69	90	1,400	30	1,400	18	260	1,260	9	4	260
13	845	1,100	4	260	1	65	1,190	2	190	190
26	845	1,600	7	480	8	160	1,160	1	300	300
60	845	1,440	100	100	4	100	1,100	1	60	60
45	845	860	9	100	4	100	1,100	1	45	45
35	845	860	4	100	4	100	1,100	1	60	60
25	845	860	4	100	4	100	1,100	1	45	45

ANNUAL REPORT OF THE

Statement—(Continued).

ANNUAL REPORT OF THE

Statement—(Continued).

TONS.		1859.		1860.		1861.		1862.		1863.	
No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
800	1	.....	1	.....	1	.....	1	.....	1	.....
250	16	.....	16	.....	16	.....	16	.....	16	.....
350	5	.....	5	.....	5	.....	5	.....	5	.....
250	1	.....	1	.....	1	.....	1	.....	1	.....
250	2	.....	2	.....	2	.....	2	.....	2	.....
250	12	.....	12	.....	12	.....	12	.....	12	.....
250	41	.....	41	.....	41	.....	41	.....	41	.....
250	5	.....	5	.....	5	.....	5	.....	5	.....
250	16	.....	16	.....	16	.....	16	.....	16	.....
250	28	.....	28	.....	28	.....	28	.....	28	.....
250	1,700	.....	1,700	.....	1,700	.....	1,700	.....	1,700	.....
250	9,020	.....	9,020	.....	9,020	.....	9,020	.....	9,020	.....
250	1,050	.....	1,050	.....	1,050	.....	1,050	.....	1,050	.....
250	88	.....	88	.....	88	.....	88	.....	88	.....
250	6,600	.....	6,600	.....	6,600	.....	6,600	.....	6,600	.....
250	169	.....	169	.....	169	.....	169	.....	169	.....
250	283	.....	283	.....	283	.....	283	.....	283	.....
150	1	.....	1	.....	1	.....	1	.....	1	.....
150	195	.....	195	.....	195	.....	195	.....	195	.....
150	6	.....	6	.....	6	.....	6	.....	6	.....
150	1,460	.....	1,460	.....	1,460	.....	1,460	.....	1,460	.....
150	6,480	.....	6,480	.....	6,480	.....	6,480	.....	6,480	.....
175	11	.....	11	.....	11	.....	11	.....	11	.....
175	88	.....	88	.....	88	.....	88	.....	88	.....
175	8,880	.....	8,880	.....	8,880	.....	8,880	.....	8,880	.....
175	6	.....	6	.....	6	.....	6	.....	6	.....
175	875	.....	875	.....	875	.....	875	.....	875	.....
175	53	.....	53	.....	53	.....	53	.....	53	.....
175	610	.....	610	.....	610	.....	610	.....	610	.....
175	4	.....	4	.....	4	.....	4	.....	4	.....
175	160	.....	160	.....	160	.....	160	.....	160	.....
175	4,050	.....	4,050	.....	4,050	.....	4,050	.....	4,050	.....
175	88	.....	88	.....	88	.....	88	.....	88	.....
175	145	.....	145	.....	145	.....	145	.....	145	.....
175	2	.....	2	.....	2	.....	2	.....	2	.....
175	880	.....	880	.....	880	.....	880	.....	880	.....
175	19	.....	19	.....	19	.....	19	.....	19	.....
175	188	.....	188	.....	188	.....	188	.....	188	.....
175	3	.....	3	.....	3	.....	3	.....	3	.....
175	890	.....	890	.....	890	.....	890	.....	890	.....
175	4	.....	4	.....	4	.....	4	.....	4	.....
175	620	.....	620	.....	620	.....	620	.....	620	.....
175	8	.....	8	.....	8	.....	8	.....	8	.....
175	1,800	.....	1,800	.....	1,800	.....	1,800	.....	1,800	.....
175	15	.....	15	.....	15	.....	15	.....	15	.....
175	2,640	.....	2,640	.....	2,640	.....	2,640	.....	2,640	.....
175	7	.....	7	.....	7	.....	7	.....	7	.....
175	1,776	.....	1,776	.....	1,776	.....	1,776	.....	1,776	.....
175	6	.....	6	.....	6	.....	6	.....	6	.....
175	650	.....	650	.....	650	.....	650	.....	650	.....
175	5	.....	5	.....	5	.....	5	.....	5	.....
175	105	.....	105	.....	105	.....	105	.....	105	.....
175	1	.....	1	.....	1	.....	1	.....	1	.....
175	6,700	.....	6,700	.....	6,700	.....	6,700	.....	6,700	.....
175	67	.....	67	.....	67	.....	67	.....	67	.....
175	1,805	.....	1,805	.....	1,805	.....	1,805	.....	1,805	.....
175	321	.....	321	.....	321	.....	321	.....	321	.....
175	4,986	.....	4,986	.....	4,986	.....	4,986	.....	4,986	.....
175	14	.....	14	.....	14	.....	14	.....	14	.....
175	103	.....	103	.....	103	.....	103	.....	103	.....
175	4,590	.....	4,590	.....	4,590	.....	4,590	.....	4,590	.....
175	85	.....	85	.....	85	.....	85	.....	85	.....
175	240	.....	240	.....	240	.....	240	.....	240	.....
175	18	.....	18	.....	18	.....	18	.....	18	.....
175	150	.....	150	.....	150	.....	150	.....	150	.....
175	7	.....	7	.....	7	.....	7	.....	7	.....
175	700	.....	700	.....	700	.....	700	.....	700	.....
175	10	.....	10	.....	10	.....	10	.....	10	.....
175	100	.....	100	.....	100	.....	100	.....	100	.....
175	1	.....	1	.....	1	.....	1	.....	1	.....
175	45	.....	45	.....	45	.....	45	.....	45	.....
175	6	.....	6	.....	6	.....	6	.....	6	.....
175	250	.....	250	.....	250	.....	250	.....	250	.....
175	9	.....	9	.....	9	.....	9	.....	9	.....
175	8	.....	8	.....	8	.....	8	.....	8	.....

N. B.—An allowance must, of course, be made of such boats as have gone out of use. Accurate accounts were made of the number of boats on the 1st of January, in

	2,975
January 1, 1847, whole number of boats	2,975
January 1, 1853, do	2,975
January 1, 1859, do	2,975
January 1, 1865, do	2,975
January 1, 1869, do	2,975
January 1, 1889, do	2,975
January 1, 1895, do	2,975
January 1, 1899, do	2,975
January 1, 1901, do	2,975

ANNUAL REPORT OF THE

STATEMENT of the number, class and tonnage of boats built and registered in 1864.

TONNAGE.	Steam.	D. bow.	Scows.	Decked scows.	Lake.	Bulk heads.	Line.	Total boats.	Total tons.
800 .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
900 .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
950 .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1000 .....	.....	.....	1	1	3	6	3	1	940
1050 .....	.....	.....	4	1	21	8	11	3	680
1100 .....	.....	5	1	55	10	8	80	11	475
1150	1	26	7	.....	.....	8	98	80	6,000
1200 .....	.....	.....	4	.....	.....	8	3	19	18,600
1250 .....	.....	.....	4	.....	.....	8	3	3	570
1300 .....	.....	.....	1	.....	.....	8	7	7	1,950
1350 .....	.....	.....	1	.....	.....	8	.....	.....	.....
1400 .....	.....	8	4	1	10	3	3	3	.....
1450	1	1	8	11	2	1	16	24	8,900
1500 .....	.....	1	1	2	1	1	3	16	2,100
1550 .....	.....	1	8	1	1	1	5	3	850
1600	1	1	9	3	3	1	5	5	625
1650	1	1	1	9	3	1	6	6	750
1700	1	1	1	9	3	1	4	4	450
1750	1	1	1	9	3	1	4	3	520
1800	1	1	23	10	4	6	88	3	8,800
1850	1	1	29	8	6	8	88	6	3,610
1900	4	4	23	8	29	1	66	1	840
1950	1	1	1	2	1	4	19	1	940
2000	1	1	11	5	5	2	1	1	840
2050	1	1	1	1	1	1	1	1	1,775
2100	1	1	1	1	1	1	1	1	450
2150	1	1	6	3	3	1	6	6	850
2200	8	.....	1	1	1	1	1	1	60
2250	1	1	1	1	1	1	8	8	135
2300	1	1	1	1	1	1	1	1	30
2350	1	1	1	1	1	1	1	1	.....
2400	1	1	1	1	1	1	1	1	.....
2450	1	1	1	1	1	1	1	1	.....
2500	1	1	1	1	1	1	1	1	.....
2550	1	1	1	1	1	1	1	1	.....
2600	1	1	1	1	1	1	1	1	.....
2650	1	1	1	1	1	1	1	1	.....
2700	1	1	1	1	1	1	1	1	.....
2750	1	1	1	1	1	1	1	1	.....
2800	1	1	1	1	1	1	1	1	.....
2850	1	1	1	1	1	1	1	1	.....
2900	1	1	1	1	1	1	1	1	.....
2950	1	1	1	1	1	1	1	1	.....
3000	1	1	1	1	1	1	1	1	.....
3050	1	1	1	1	1	1	1	1	.....
3100	1	1	1	1	1	1	1	1	.....
3150	1	1	1	1	1	1	1	1	.....
3200	1	1	1	1	1	1	1	1	.....
3250	1	1	1	1	1	1	1	1	.....
3300	1	1	1	1	1	1	1	1	.....
3350	1	1	1	1	1	1	1	1	.....
3400	1	1	1	1	1	1	1	1	.....
3450	1	1	1	1	1	1	1	1	.....
3500	1	1	1	1	1	1	1	1	.....
3550	1	1	1	1	1	1	1	1	.....
3600	1	1	1	1	1	1	1	1	.....
3650	1	1	1	1	1	1	1	1	.....
3700	1	1	1	1	1	1	1	1	.....
3750	1	1	1	1	1	1	1	1	.....
3800	1	1	1	1	1	1	1	1	.....
3850	1	1	1	1	1	1	1	1	.....
3900	1	1	1	1	1	1	1	1	.....
3950	1	1	1	1	1	1	1	1	.....
4000	1	1	1	1	1	1	1	1	.....
4050	1	1	1	1	1	1	1	1	.....
4100	1	1	1	1	1	1	1	1	.....
4150	1	1	1	1	1	1	1	1	.....
4200	1	1	1	1	1	1	1	1	.....
4250	1	1	1	1	1	1	1	1	.....
4300	1	1	1	1	1	1	1	1	.....
4350	1	1	1	1	1	1	1	1	.....
4400	1	1	1	1	1	1	1	1	.....
4450	1	1	1	1	1	1	1	1	.....
4500	1	1	1	1	1	1	1	1	.....
4550	1	1	1	1	1	1	1	1	.....
4600	1	1	1	1	1	1	1	1	.....
4650	1	1	1	1	1	1	1	1	.....
4700	1	1	1	1	1	1	1	1	.....
4750	1	1	1	1	1	1	1	1	.....
4800	1	1	1	1	1	1	1	1	.....
4850	1	1	1	1	1	1	1	1	.....
4900	1	1	1	1	1	1	1	1	.....
4950	1	1	1	1	1	1	1	1	.....
5000	1	1	1	1	1	1	1	1	.....
5050	1	1	1	1	1	1	1	1	.....
5100	1	1	1	1	1	1	1	1	.....
5150	1	1	1	1	1	1	1	1	.....
5200	1	1	1	1	1	1	1	1	.....
5250	1	1	1	1	1	1	1	1	.....
5300	1	1	1	1	1	1	1	1	.....
5350	1	1	1	1	1	1	1	1	.....
5400	1	1	1	1	1	1	1	1	.....
5450	1	1	1	1	1	1	1	1	.....
5500	1	1	1	1	1	1	1	1	.....
5550	1	1	1	1	1	1	1	1	.....
5600	1	1	1	1	1	1	1	1	.....
5650	1	1	1	1	1	1	1	1	.....
5700	1	1	1	1	1	1	1	1	.....
5750	1	1	1	1	1	1	1	1	.....
5800	1	1	1	1	1	1	1	1	.....
5850	1	1	1	1	1	1	1	1	.....
5900	1	1	1	1	1	1	1	1	.....
5950	1	1	1	1	1	1	1	1	.....
6000	1	1	1	1	1	1	1	1	.....
6050	1	1	1	1	1	1	1	1	.....
6100	1	1	1	1	1	1	1	1	.....
6150	1	1	1	1	1	1	1	1	.....
6200	1	1	1	1	1	1	1	1	.....
6250	1	1	1	1	1	1	1	1	.....
6300	1	1	1	1	1	1	1	1	.....
6350	1	1	1	1	1	1	1	1	.....
6400	1	1	1	1	1	1	1	1	.....
6450	1	1	1	1	1	1	1	1	.....
6500	1	1	1	1	1	1	1	1	.....
6550	1	1	1	1	1	1	1	1	.....
6600	1	1	1	1	1	1	1	1	.....
6650	1	1	1	1	1	1	1	1	.....
6700	1	1	1	1	1	1	1	1	.....
6750	1	1	1	1	1	1	1	1	.....
6800	1	1	1	1	1	1	1	1	.....
6850	1	1	1	1	1	1	1	1	.....
6900	1	1	1	1	1	1	1	1	.....
6950	1	1	1	1	1	1	1	1	.....
7000	1	1	1	1	1	1	1	1	.....
7050	1	1	1	1	1	1	1	1	.....
7100	1	1	1	1	1	1	1	1	.....
7150	1	1	1	1	1	1	1	1	.....
7200	1	1	1	1	1	1	1	1	.....
7250	1	1	1	1	1	1	1	1	.....
7300	1	1	1	1	1	1	1	1	.....
7350	1	1	1	1	1	1	1	1	.....
7400	1	1	1	1	1	1	1	1	.....
7450	1	1	1	1	1	1	1	1	.....
7500	1	1	1	1	1	1	1	1	.....
7550	1	1	1	1	1	1	1	1	.....
7600	1	1	1	1	1	1	1	1	.....
7650	1	1	1	1	1	1	1	1	.....
7700	1	1	1	1	1	1	1	1	.....
7750	1	1	1	1	1	1	1	1	.....
7800	1	1	1	1	1	1	1	1	.....
7850	1	1	1	1	1	1	1	1	.....
7900	1	1	1	1	1	1	1	1	.....
7950	1	1	1	1	1	1	1	1	.....
8000	1	1	1	1	1	1	1	1	.....
8050	1	1	1	1	1	1	1	1	.....
8100	1	1	1	1	1	1	1	1	.....
8150	1	1	1	1	1	1	1	1	.....
8200	1	1	1	1	1	1	1	1	.....
8250	1	1	1	1	1	1	1	1	.....
8300	1	1	1	1	1	1	1	1	.....
8350	1	1	1	1	1	1	1	1	.....
8400	1	1	1	1	1	1	1	1	.....
8450	1	1	1	1	1	1	1	1	.....
8500	1	1	1	1	1	1	1	1	.....
8550	1	1	1	1	1	1	1	1	.....
8600	1	1	1	1	1	1	1	1	.....
8650	1	1	1	1	1	1	1	1	.....
8700	1	1	1	1	1	1	1	1	.....
8750	1	1	1	1	1	1	1	1	.....
8800	1	1	1	1	1	1	1	1	.....
8850	1	1	1	1	1	1	1	1	.....
8900	1	1	1	1	1	1	1	1	.....
8950	1	1	1	1	1	1	1	1	.....
9000	1	1	1	1	1	1	1	1	.....
9050	1	1	1	1	1	1	1	1	.....
9100	1	1	1	1	1	1	1	1	.....
9150	1	1	1	1	1	1	1	1	.....
9200	1	1	1	1	1	1	1	1	.....
9250	1	1	1	1	1	1	1	1	.....
9300	1	1	1	1	1	1	1	1	.....
9350	1	1	1	1	1	1	1	1	.....
9400	1	1	1	1	1	1	1	1	.....
9450	1	1	1	1	1	1	1	1	.....
9500	1	1	1</td						

CANAL COMMISSIONERS.

233

STATEMENT of the number, class and tonnage of boats built and registered in 1865.

TONNAGE.	Steam.	D. bow.	Scows.	Decked scows.	Lake.	Bull heads.	Line.	Total boats.	Total tons.
800.....									
760.....									
250.....									
240.....									
230.....									
225.....									
220.....									
210.....									
200.....									
190.....									
180.....									
170.....									
160.....									
150.....									
140.....									
130.....									
125.....									
120.....									
115.....									
110.....									
100.....									
95.....									
90.....									
85.....									
80.....									
75.....									
70.....									
60.....									
50.....									
45.....									
30.....									
25.....									
20.....									
6.....									
Total	8	46	24	19	84	24	24	200	38,795

ANNUAL REPORT OF THE

STATEMENT of the number, class and tonnage of boats built and registered in 1866.

TONNAGE.	Steam.	D. bow.	Scows.	Decked scows.	Lake.	Bull heads.	Line.	Total boats.	Total tons.
300.....									
280.....									
260.....									
240.....									
220.....									
200.....									
180.....									
170.....									
160.....									
150.....									
140.....									
130.....									
120.....									
110.....									
100.....									
90.....									
80.....									
70.....									
60.....									
50.....									
45.....									
30.....									
20.....									
10.....									
6.....									
Total.....	2	9	111	180	165	68	...	485	74,630

CANAL COMMISSIONERS.

235

STATEMENT of the number, class and tonnage of boats built and registered in 1867.

TONNAGE.	M. bow.	D. bow.	Scows.	Decked scows.	Lake.	Bull heads.	Line.	Total boats.	Total tons.
800.....
280.....	9	1,000
250.....	13	47	47	11,320	11,320
240.....	6	43	43	9,660	9,660
230.....	6	29	29	6,926	6,926
220.....	5	47	47	10,340	10,340
210.....	4	56	56	11,200	11,200
200.....	2	5	5	950	950
190.....
180.....
170.....	1	1	1	13	1,600
160.....	1	6	6	7	980
150.....	12	1	1	30	2,600
140.....	2	1	1	4	500
130.....	7	1	1	16	1,220
120.....	7	.....	.....	.....	.....
110.....	7	.....	.....	.....	.....
100.....	16	.....	.....	114	11,400
90.....	16	.....	.....	88	7,476
80.....	11	11	11	23	1,750
70.....	13	1	1	7	1,625
60.....	6	2	2	4	280
50.....	1	1	1	2	120
40.....	1	1	1	1	60
30.....	1	1	1	1	50
20.....	1	1	1	1	30
10.....	1	1	1	1	10
5.....	1	1	1	1	5
Total.....	66	27	70	78	208	78	78	520	80,360

STATEMENT of the number, class and tonnage of boats built and registered in 1868.

CANAL COMMISSIONERS.

237

STATEMENT of the number, class and tonnage of boats built and registered in 1869.

TONNAGE.	M. bow.	D. bow.	Scows.	Decked scows.	Lake.	Bull heads.	Line.	Total boats.	Total tons.
300									
350									
400									
450									
500									
550									
600									
650									
700									
750									
800									
850									
900									
950									
1000									
1050									
1100									
1150									
1200									
1250									
1300									
1350									
1400									
1450									
1500									
1550									
1600									
1650									
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1750									
1800									
1850									
1900									
1950									
2000									
2050									
2100									
2150									
2200									
2250									
2300									
2350									
2400									
2450									
2500									
2550									
2600									
2650									
2700									
2750									
2800									
2850									
2900									
2950									
3000									
3050									
3100									
3150									
3200									
3250									
3300									
3350									
3400									
3450									
3500									
3550									
3600									
3650									
3700									
3750									
3800									
3850									
3900									
3950									
4000									
4050									
4100									
4150									
4200									
4250									
4300									
4350									
4400									
4450									
4500									
4550									
4600									
4650									
4700									
4750									
4800									
4850									
4900									
4950									
5000									
5050									
5100									
5150									
5200									
5250									
5300									
5350									
5400									
5450									
5500									
5550									
5600									
5650									
5700									
5750									
5800									
5850									
5900									
5950									
6000									
6050									
6100									
6150									
6200									
6250									
6300									
6350									
6400									
6450									
6500									
6550									
6600									
6650									
6700									
6750									
6800									
6850									
6900									
6950									
7000									
7050									
7100									
7150									
7200									
7250									
7300									
7350									
7400									
7450									
7500									
7550									
7600									
7650									
7700									
7750									
7800									
7850									
7900									
7950									
8000									
8050									
8100									
8150									
8200									
8250									
8300									
8350									
8400									
8450									
8500									
8550									
8600									
8650									
8700									
8750									
8800									
8850									
8900									
8950									
9000									
9050									
9100									
9150									
9200									
9250									
9300									
9350									
9400									
9450									
9500									
9550									
9600									
9650									
9700									
9750									
9800									
9850									
9900									
9950									
10000									
Total	46	24	68	10	114	41			298

RATES OF TOLL—1870.

ESTABLISHED BY THE CANAL BOARD ON PERSONS AND PROPERTY TRANSPORTED ON THE NEW YORK STATE CANALS, TO TAKE EFFECT ON THE OPENING OF NAVIGATION.

Toll is to be computed upon the Weight ("1,000 pounds per mile") of all articles contained in the following list, unless otherwise stated, opposite to the articles excepted.

A.

	cts.	m.	fr.
Acid sulphuric	0	2	0
Agricultural implements, going from tide-water.....	0	1	5
Articles not enumerated, going toward tide-water.....	0	2	0
On the same, going from tide-water.....	0	1	5
Agricultural productions of the United States, not particularly specified..	0	2	0
Apples.....	0	2	0
Ashes, pot and pearl.....	0	2	0
Ashes, leached.....	0	0	5

B.

Bacon	0	1	0
Barley.....	0	1	5
Barrels, empty, transported in boats.....	0	1	0
Barrels, empty, transported in rafts.....	0	5	0
Bars of iron.....	0	1	5
Barytes.....	0	1	5
Beans.....	0	1	5
Bedstead stuff (see <i>Lumber No. 3</i>).....	0	2	0
Beef, salted	0	1	5
Bleaching powders, going from tide-water.....	0	1	0
Bloom iron, going from tide-water.....	0	0	5
Boat knees (see <i>Lumber No. 3</i>).....	0	2	0
Boats, used chiefly for transportation of passengers upon <i>all canals</i> , per mile On same, if they elect to commute for tolls upon passengers.....	4	0	0
Boats, used chiefly for transportation of property, per mile.....	3	0	0
On the same, if they elect to commute for tolls upon passengers.....	2	0	0
Boats registered before July 1st, 1862, whose bows do not conform to regulation No. 40, per mile.....	2	3	0
Bolts, stave, if carried in boats.....	0	0	0
Bolts, stave, if carried in rafts	0	5	0
Bones	0	0	5
Boxes, stuff for (see <i>Lumber No. 3</i>).....	0	2	0
Bran	0	1	0
Brick	0	1	0
Brimstone	0	1	0
Broom handles (see <i>Lumber No. 3</i>).....	0	2	0
Brush backs (see <i>Lumber No. 3</i>).....	0	2	0
Brush handles (see <i>Lumber No. 3</i>).....	0	2	0
Buffalo skins	0	2	5
Butter	0	1	5
Butts, stave, if carried in boats	0	5	0

C.

Cabinet ware	0	1	5
Carboys.....	0	2	0
Carts.....	0	2	0

	cts. m. fr.
Car axles	0 1 0
Car wheels (iron)	0 0 5
Carriages and sleighs	0 2 0
Casks, empty, transported in boats	0 1 0
Casks, empty, transported in rafts	0 5 0
Castings, all iron casting	0 1 5
Cattle, alive	0 2 0
Cedar posts (see <i>Lumber No. 2</i>) per 1,000 feet per mile	0 5 5
Cedar, red (see <i>Lumber 2</i>) per 1000 feet per mile	0 5 5
Cement, fire proof	0 1 0
Chair stuff (see <i>Lumber No. 3</i>)	0 2 0
Charcoal	0 0 5
Cheese	0 1 5
Cider	0 1 5
Clay	0 1 0
Clover seed	0 2 0
Coal, anthracite	0 0 5
Coal, bituminous	0 0 5
Coal oil	0 0 5
Coal tar and products thereof	0 0 5
Coffee	0 1 0
Copper ore	0 1 0
Copper, pig and smelted	0 1 0
Corn	0 1 5
Corn meal	0 1 5
Cotton	0 1 0
Crockery	0 1 0

D.

Deer skins	0 2 5
Domestic distilled spirits	0 1 5
Domestic cottons	0 1 5
Domestic woolens	0 1 5

E.

Earth	0 0 5
Esculent roots	0 1 0

F.

Fellies (see <i>Lumber No. 2</i>)	0 2 0
Fire-proof cement	0 1 0
Fire brick	0 1 0
Fish, salted, going from tide-water	0 1 0
Flax seed	0 2 0
Flour	0 1 5
Furniture, cabinet ware and chairs	0 1 5
Furniture for stoves, not cast-iron	0 1 5
Furs, and skins of animals producing furs	0 2 5

G.

Gas pipes	0 1 0
Glass ware	0 1 5
Grass seed	0 2 0
Grease	0 1 5
Gunstocks (see <i>Lumber No. 3</i>)	0 2 0
Gypsum, ground and unground	0 1 0

H.

Hand spikes (see <i>Lumber No. 3</i>)	0 2 0
Hay, pressed	0 0 5
Heading, undressed, transported in boats	0 1 0
Heading, dressed or partly dressed	0 1 0
Heading, transported in rafts	0 5 0

	cts. m. fr.
Hemp, going toward tide-water.....	0 1 0
Hides.....	0 1 5
Hogs, alive.....	0 2 0
Hops.....	0 2 0
Hop poles (see <i>Lumber No. 3</i>)	0 2 0
Hop poles, transported in rafts.....	0 5 0
Hoop poles (see <i>Lumber No. 3</i>)	0 2 0
Hoop poles, transported in rafts.....	0 5 0
Hoops, rived.....	0 2 0
Horses.....	0 3 0
Horses, used exclusively for towing boats and other floats, exempt from toll.	
Horse shoes.....	0 0 5
Hobs (see <i>Lumber No. 3</i>)	0 2 0

I.

Ice.....	0 0 5
Iron, in sheets, bars and bundles	0 1 5
Iron ore.....	0 0 5
Iron, bloom and pig, going toward tide-water.....	0 1 0
Iron, bloom and pig, going from tide-water.....	0 0 5
Iron, boiler.....	0 1 5
Iron, bridge and railing.....	0 1 5
Iron bolts.....	0 1 5
Iron safes.....	0 1 5

J.

Junk	0 1 5
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L.

Lard	0 1 0
Lard oil.....	0 1 0
Last blocks (see <i>Lumber No. 3</i>)	0 2 0
Lath (see <i>Lumber No. 1</i>)	0 2 0
Lath (see <i>Lumber No. 2</i>) per 1,000 feet, per mile, surface measure	0 5 5
Lath (see <i>Lumber No. 3</i>)	0 2 0
Lead, bar and pig, going toward tide-water.....	0 0 5
Leather.....	0 1 5
Lime, manufactured.....	0 1 0
Lime, water.....	0 1 0
Limestone.....	0 0 5
Looking-glass backs (see <i>Lumber No. 3</i>)	0 2 0

LUMBER, No 1.*

Transported by boats, by weight, per 1,000 pounds per mile.

White pine, white wood, cherry, bass wood, cedar boards, planks, scantling, and on all sidings, lath and other sawed stuff less than one inch thick (except such as are enumerated in <i>Lumber No. 3</i>)	0 2 0
Oak, hickory, beech, sycamore, black walnut, butternut, maple, ash, elm, fir, tamarack and yew.....	0 1 5
Hemlock and spruce.....	0 1 0

LUMBER No. 2.*

Transported in boats by measurement, per 1,000 feet, per mile:

Boards, planks, scantling, railroad ties and sawed timber, reduced to inch measure, and all siding, lath and other sawed stuff, less than one inch thick (except such as is enumerated in <i>Lumber No. 3</i>), tolls computed on surface measure; and all kinds of red cedar, cedar posts, estimated that a cord, after deducting for openings, will contain 1,000 feet	0 5 5
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* LUMBER shall not be cleared by measurement when carried in a boat having other articles on board paying toll by weight, but such lumber shall, in all such cases, be also cleared by weight.

When a cargo is composed entirely of lumber, which can be cleared by weight or measure, the whole of such cargo shall be cleared by measurement or by weight, as the shipper or master may elect, and in no case shall a portion of any such cargo be cleared by measurement and the other portion by weight.

	cts.	m.	fr.
Hemlock, per 1,000 feet, per mile, when not weighed	0	3	0
Lumber No. 2, transported in rafts, per 1,000 feet, per mile.....	2	5	0

LUMBER NO. 3.*

Transported in boats by weight, per 1,000 pounds, per mile:

Sawed lath of less than 10 feet in length, split lath, hoop poles, hand spikes, rowing oars, broom handles, spokes, hubs, treenails, fellies, boat and ship knees, plane stocks, pickets for fences, railroad ties, last blocks, stuff—manufactured or partly manufactured—for boxes, chairs and bedsteads, hop poles, brush handles, brush backs, looking-glass backs, gun stocks, plow beams and plow handles.....	0	2	0
Sawed stuff for window blinds not exceeding one-fourth of an inch in thickness	0	5	0

M.

Mahogany	0	1	5
Manure	0	0	5
Marl	0	0	5
Merchandise, non-enumerated	0	1	5
Molasses	0	1	0
Moose skins	0	2	5

N.

Nails	0	0	5
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O.

Oats	0	1	5
Oil cake	0	1	5
Oil meal	0	1	5
Onions	0	1	0

P.

Passengers, over ten years of age, per mile	0	0	5
Petroleum or earth oil, crude and refined	0	0	5
Peas	0	1	5
Peat	0	0	5
Pickets for fences (see Lumber No. 3)	0	2	0
Pig copper	0	1	0
Pig iron, going from tide-water	0	0	5
Pig iron, going toward tide-water	0	1	0
Plane stocks (see Lumber No. 3)	0	2	0
Plaster, calcined, or plaster of paris, going from tide-water	0	1	0
Plow beams (see Lumber No. 3)	0	2	0
Plow handles (see Lumber No. 3)	0	2	0
Pork, salted	0	1	5
Posts, split and round, not exceeding eight feet in length, carried in boats, per M, per mile	2	0	0
Potatoes	0	2	0
Powder and gunpowder	0	4	0

R.

Rags	0	1	5
Railroad chairs	0	1	0
Railroad iron	0	1	0
Railroad ties (see Lumber Nos. 2 and 3.)	0	1	0

* LUMBER shall not be cleared by measurement when carried in a boat having other articles on board paying toll by weight, but such lumber shall, in all such cases, be also cleared by weight.

When a cargo is composed entirely of lumber, which can be cleared by weight or measure, the whole of such cargo shall be cleared by measurement or by weight, as the shipper or master may elect, and in no case shall a portion of any such cargo be cleared by measurement and the other portion by weight.

	cts. m. fr.
Rails for fences, not exceeding fourteen feet in length, carried in boats, per M, per mile.....	2 0 0
On the same, if carried in rafts, per M, per mile	8 0 0
Rice, going from tide-water	0 1 0
Roots, esculent.....	0 1 0
Rowing oars (see <i>Lumber No. 3</i>)	0 2 0
Rye	0 1 5
S.	
Sal soda, going from tide-water.....	0 1 0
Salted fish, going from tide-water.....	0 1 0
Salt, foreign	0 2 5
Salt, manufactured in this State	0 1 0
Sand	0 0 5
Sawed stuff (see <i>Lumber Nos. 2 and 3</i>)	
Sawdust.....	0 0 5
Scrap iron	0 0 5
Sheep, live	0 2 0
Shingles, in boats, per 1,000 pounds, per mile.....	0 1 5
Shingles, in boats, per M, per mile.....	0 0 5
Shingles, per M, per mile, in rafts	0 4 0
Ship knees	0 2 0
Ship knees, transported in rafts	0 5 0
Ship stiffs.....	0 1 5
Shooks, stave	0 1 0
Shrubbery and trees	0 4 0
Siding (see <i>Lumber No. 1</i>)	0 2 0
Siding (see <i>Lumber No. 2</i>), per 1,000 feet, surface measure	0 5 5
Skins of animals producing furs	0 2 5
Slate	0 0 5
Sleighs	0 2 0
Soda ash	0 1 0
Spikes.....	0 0 5
Split posts and round, not exceeding eight feet in length, carried in boats, per M, per mile	2 0 0
On the same, if carried in rafts, per M, per mile	8 0 0
Spokes (see <i>Lumber No. 3</i>)	0 2 0
Staves and heading, sawed, cut and dressed or partly dressed, shooks and stave bolts and butts, not exceeding four feet and a half in length, transported in boats	0 1 0
On the same if transported in rafts	0 5 0
Steel	0 1 5
Stone for the manufacture of lime	0 0 5
Stone, wrought	0 1 0
Stone, unwrought and partly wrought	0 0 5
Stoves.....	0 1 5
Straw, pressed, and any pressed vegetable substance used for the manufacture of paper or paper pulp.....	0 0 5
Sugar	0 1 0
T.	
Tallow	0 1 5
Tan bark, per cord, per mile, carried in boats.....	0 5 0
Tan bark, per cord, per mile, carried in rafts.....	2 0 0
Tan bark, ground, per 1,000 pounds, per mile.....	0 2 5
Tar	0 1 5
TIMBER, per 100 cubic feet, per mile, transported in boats:	
Squared and round, other than hemlock.....	0 6 0
Squared and round, hemlock	0 4 0
Squared and round (all kinds), transported in rafts	1 0 0
Sawed timber (see <i>Lumber No. 2</i>), per 1,000 feet, per mile	0 5 5
Tin plate, going from tide water	0 0 5
Tobacco, manufactured, going toward tide-water	0 1 0
Tobacco, going from tide-water.....	0 1 5
Treenails (see <i>Lumber No. 3</i>)	0 2 0

	cts. m. fr.
Trees and shrubbery.....	0 4 0
Turnips	0 1 0
Turpentine	0 1 5
V.	
Varnish	0 1 5
Vinegar	0 1 5
W.	
Wagon	0 2 0
Water lime, going from tide-water.....	0 1 0
Water lime, going toward tide-water	0 1 0
Water pipes	0 1 0
Wheat	0 1 5
Window blinds, sawed stuff for (see <i>Lumber No. 3</i>).....	0 5 0
Window sashes	0 5 0
Wood for fuel, per cord, per mile	0 5 0
Wood for fuel, per cord, per mile, carried in rafts	2 0 0
Wood, used in the manufacture of salt, per cord, per mile.....	0 5 0
Wool	0 1 0

STATE OF NEW YORK, CANAL DEPARTMENT, }
ALBANY, May 3, 1870. }

I certify the foregoing to be a correct list of the rates of toll this day established by the Canal Board, to take effect on the opening of navigation.

JAMES A. BELL, *Auditor.*

REGULATIONS RELATIVE TO LUMBER.

The collectors of canal tolls at Rochester, Syracuse and Utica, where a boat having on board sawed lumber or cord wood, which has been cleared, either by count, measurement or weight, is unloaded at either of said offices, and the collectors of canal tolls at Waterford, West Troy and Albany, in every instance where a boat having on board sawed lumber or cord wood, shall pass into the Hudson river, or where the cargo is unloaded at either of said offices, which has not been measured or counted by either of them, shall require the master or owner to produce the certificate of a city inspector or measurer before a new clearance is granted to said boat, stating the count or measurement of the quantity of each kind of lumber in feet, and the number of cords of wood of which said cargo was composed; and every such inspector or measurer may give his certificate upon his own personal inspection of the count or measurement; or he may give his certificate upon the written statement of the owner or consignee of said wood or lumber, which statement shall, in all cases, be accompanied with an affidavit of the measurement or count from a person of good character, and a competent measurer of lumber or wood, in the following form, viz.:

I, _____ of _____, do swear that I have measured the entire cargo of the boat _____ of _____, of which _____ is master, and that the following is a true statement or bill of the number of pieces, and the quantity in board measure, where pieces were not less than one inch thick, and the number of pieces and the quantity in surface measure, where the pieces were less than one inch thick of each kind of lumber comprising said cargo, viz. :

[Here give the quantity of *each kind* of lumber in feet.]

And I do further swear, that where the _____ were not of uniform length or width, I measured each piece, and have given the true contents of the whole, having made no deduction for defective lumber.

Sworn before me this
day of _____, 18 . }

And the collector may also require the master of the boat to add his oath to the certificate of the lumber inspector, as follows:

I, A. B., master of the boat _____, of _____, do swear, that no part of the lumber embraced in the bill of lading and clearance was taken from said boat, from the time said clearance and bill of lading were given to me, until the same was unloaded at _____, on the _____ day _____, 18 .

[If lumber has been previously unloaded from same cargo, state the *kind*, quantity and place of unloading.]

Sworn before me, this
day of _____, 18 . }

And the certificate of the said city inspector shall certify on what evidence his certificate is given, and such certificate and evidence shall be carefully preserved in the collector's office; and in every instance where, in the opinion of the collector, this certificate cannot be furnished, or where he shall have any doubts that such certificate includes the whole amount of said cargo, he shall administer an oath to the master or owner of the boat, in relation to the correctness of his clearance.

The bill of lading of each boat loaded with lumber, and *destined to New York*, must be verified in the following manner, to entitle such boat to a clearance, viz.:

1. Where the master does not superintend the loading of the boat, the shipper, or some person who has such superintendence, must swear to the correctness of the bill of lading, as follows:

I, _____, of the town of _____, do swear that I superintended the loading of the boat _____ of _____, of which _____ is master, at _____, and that the above is a true bill of lading of said boat, and gives the number of feet in board measure, where the boards are not less than one inch thick, and the number of feet in surface measure, where the boards are less than one inch thick; and that no articles of freight of any kind, other than those specified in said bill, were put on board of said boat up to the time that _____ took charge of the boat as master.

Sworn before me this
day of _____, 18 . }

The master of the boat will be required to make the following oath:

I, A. B., master of the boat _____, of _____, do swear, that no addition has been made to the cargo of said boat since the bill of lading and affidavit annexed were delivered to me, and according to the best of my knowledge and belief, the said bill represents truly all the freight on board of said boat.

Sworn before me, this
day of _____, 18 . }

2. Where the master superintends the loading of the boat, the bill of lading may be signed by the shipper, and be verified by the oath of the master, as follows:

I, _____, master of the boat _____, of _____, do swear that I superintended the loading of the boat _____, of _____, at _____, and that the above is a true bill of lading of said boat, and gives the number of feet in board measure, where the boards are not less than one inch thick, and the number of feet in surface measure, where the boards are less than one inch thick, and that no articles of freight of any kind are on board of said boat, other than those specified in the bill of lading now presented to obtain a clearance.

Sworn before me, this
day of _____, 18 . }

Each boat destined to New York shall be furnished with a duplicate of its bill of lading, which must be left with the collector at the place where it enters the Hudson river.

In the measurement of timber to be floated on the canal, bark adhering to the wood and refuse stuff are to be estimated as forming part of the timber, and to be rated accordingly; and the inspectors are instructed to make their measurements according to these directions.

Whenever cord wood or sawed lumber shall be delivered to more than one owner or consignee, from the same cargo, the master of such boat shall deliver to a canal boat inspector a statement from each owner or consignee of the quantity in feet of each kind of lumber, and the number of cords of wood received by him from such cargo, and such statement shall be accompanied by an affidavit such as is first above prescribed, omitting the words "entire cargo," and substituting therefor "all of that portion of said cargo delivered to (here insert the owner or consignee's name)," and every master who shall violate the provisions of this regulation, shall forfeit the sum of ten dollars.

Whenever a cargo of cord wood or sawed lumber, or any portion thereof, is unloaded at a place where there is no collector, the master of said boat shall attend to the measurement of said lumber or wood when it is delivered, and it shall be the duty of said master to deliver to the nearest collector, or the collector next in order on his passage, a statement showing the kind or kinds and quantity of all the lumber in feet, and the number of all the cords of wood so unloaded, which statement shall be sworn to before the collector to whom it is delivered; and every master who shall violate the provision of this regulation shall forfeit the sum of ten dollars.

INFORMATION NECESSARY FOR THOSE WHO NAVIGATE THE CANALS.

BILL OF LADING.

Every master of a boat conveying property on a canal, shall exhibit to the several collectors, hereafter mentioned, a just and true account or bill of lading of such property, signed by himself and by the consignor thereof, containing:

1. The name of each place on the canal where any portion of such property was shipped, and of the place for which it is intended to be cleared.
2. A statement of the names, description and weight of all the articles of such property, on which toll is charged by the ton, of the number of articles on which toll is charged by the number, and of the feet of each article on which toll is charged by the foot.
3. A specification of the weight or quantity of each article, where a different rate of toll is charged on different articles, on which toll is so computed.

4. No clearance of a boat and cargo shall be granted or issued by any collector of canal tolls, except upon the production to him of a bill of lading containing the above particulars.

If on the passage, other articles are taken on board, the master must enter the number or weight of such articles on the bill.

~~(1)~~ Property taken on within one mile of a collector's office, must pay toll at and be cleared from that office.

~~(1)~~ Every master should know the contents of his cargo, so that he can, if required, verify his bill of lading by his oath.

~~(1)~~ Masters who transport lumber by the pound or foot, or wood by the cord, if they take the estimate of the owner, should require him to give a bill signed by himself, and for the accuracy of which he is willing to be responsible; otherwise the master or his boat, being responsible for the treble toll to the State, may be without

remedy against the person who makes the erroneous shipping bill. [For the penalties for false bills, see 1 R. S., 1st ed., sections 123, 124 and 125.]

CLEARANCE.

Every boat must have a clearance, and no boat can proceed beyond the place cleared to, or unlade any article before or after its arrival there, until the clearance is delivered to the collector. If there be no collector there, the clearance is to be left with the last collector. For neglecting to deliver the clearance the fine is ten dollars. The master can have a certified copy for sixpence, if not over 200 words, counting each figure as a word; if over 200 words, for one shilling, and no more in any case. Copies of clearances to get toll refunded, where a collector makes a mistake, are to be furnished without charge; property transferred from one boat to another must in all cases be recleared. A boat or float whose clearance is lost, or is claimed to be lost, must be detained until it reclear and pay the toll for the whole voyage, or produce a duplicate clearance from the office where its first clearance is claimed to have been issued. If the master or owner elects to reclear, no toll will be refunded in consequence of having paid the toll a second time, unless the original clearance is produced.

RAFTS.

Every raft navigating at night must carry a conspicuous light on the forward end of the same, and every raft moored or tied up, is, at all times during the night, to have a conspicuous light at each end of each tow, near the outer corners thereof. Penalty for each offense, ten dollars.

WEIGH LOCK.

Light Weight.—A new boat must get its light weight within thirty days after its first clearance, or be subject to a penalty of five dollars at each weigh-lock. After a new boat gets its light weight, it may continue to run, not to exceed four years, without getting another light weight, and without incurring a penalty for the omission to do so, unless it be ordered again to weigh light; or where the weight of a boat has been lessened since a light weight was obtained.

RELATIVE TO REFUNDING.

More by Lock.—If a master be dissatisfied with an addition by one weigh lock, he should go into another; if the second lock differs from the first, and he is still dissatisfied, he may, if he chooses, go into a third, if there be one. If he passes the third without weighing, nothing will be refunded on account of the addition by the first. If he weighs in the third, the average of the locks will determine whether he shall have toll refunded or pay more.

Less by Lock.—Although a weigh lock may show a cargo to weigh less than the bill of lading, before toll will be refunded on the difference, the master must prove what particular article, and how much of it, is entered wrong on his bill, and that every other article is entered right. The cargo must be weighed in at least two weigh locks.

Toll will not be refunded on an addition made by a weigh lock, in consequence of using the light weight of a previous year, except in case of addition made to a cargo under the first clearance for the season, and then only when such first clearance shall have been taken at a place where there is no weigh lock.

ADDITION TO BOAT.

Before toll will be refunded in consequence of an increase in the weight of a boat, by an addition made to it after a light weight has been obtained, a *new light weight* must be taken. Affidavits in relation to any increase to the weight of a boat, without such new light weight, will not be received. Toll will only be refunded on the first cargo after such increase in the weight of a boat was made.

BOAT AND CARGO STOPPED SHORT OF POINT CLEARED TO.

Any collector will refund in a case where a boat for any reason cannot proceed, on the delivery of the original clearance, and the affidavit of the master that he paid the toll on the boat and cargo, and that he is the owner of the boat, or runs the same on his own account, or that he is authorized by the person or persons who did pay it (which authority shall be in writing, signed by such person or persons, and deposited with the collector) to receive and receipt for the same.

MIXED CARGO.

Any addition by weigh lock to a mixed cargo will be upon articles subject to the *highest rate of toll*, and going the *farthest distance*, unless the master furnishes the collector *proof* of the specific article which caused the addition.

NEW BOATS.

The owner of every NEW BOAT must file with a collector a "certificate of registry," containing the name or names of the owners, their place of abode, the name of the boat, and its hauling place; also stating the tonnage of the boat, and whether it be a steamer, packet, line, lake, bull-head, open scow, or decked scow. If the owners reside out of the State, it is to be signed by the master. If the master of a boat owned out of the State be changed, the new master must file another certificate. No boat registered since the first day of July, 1862, whose bow does not conform to the 40th regulation of the Canal Roard, will be allowed, under any circumstances, to navigate the canals of the State.

NAME OF BOAT.

The name of the boat, with the hauling place, as it is registered, must be PAINTED in letters at least four inches in height, on some CONSPICUOUS and PERMANENT part of the OUTSIDE of the boat. No boat will hereafter be permitted to change its name or its hauling place; and for painting a new name or hauling place, which is considered part of the name, or for reporting a boat by a name different from the registered name, to any collector, the penalty is ten dollars.

When a person sells a boat, unless he requires the purchaser to file a certificate of "change of ownership" with a collector, he is still deemed in law the owner, and is liable for tolls and fines.

INJURING OR OBSTRUCTING THE CANALS—PENALTIES THEREFOR.

For using a setting pole pointed with iron or other metal; for obstructing the canal by mooring a float, sinking a vessel, timber, stone, etc.; and for omitting to have a knife on the stem of the boat, there is, in the first case, a penalty of five dollars, and in the other two, of ten dollars each.

DEDUCTION FOR WATER.

No greater deduction shall be made from the weight of any boat and cargo, on account of *water in the boat*, by any weigh master weighing a loaded boat, than the amount of the water *credited and registered* to said boat when *last weighed light*.

BOATS AT NEW YORK AND BUFFALO.

Masters of boats going to New York must, on their return, produce to the collector where the boat enters the canal from the Hudson river, full and satisfactory evidence of the correctness of the clearance and bill of lading of the down cargo, and that the full tolls have been paid thereon. If this be not done the return clearance must be refused in all cases; and such boats as do not clear at Buffalo must bring back the certificate of the canal collector in Buffalo as to the correctness of the up cargo, or the collector at Tonawanda will not clear them.

HEIGHT OF BOATS ALLOWED ON THE ERIE, OSWEGO, AND CAYUGA AND SENECA CANALS.

No boat or other craft whose height or distance from the water line of such boat or craft to the top thereof shall exceed eleven feet and three inches; and no loaded boat or other craft whose cargo, or any part thereof, is so arranged or placed on such boat or craft, so that the top or extreme height of the same shall exceed eleven feet and three inches from the water line of such laden boat or craft; and no steamboat, tug, or other craft propelled by steam, whose height when the top of the deck machinery, fixtures, or other apparatus, shall exceed eleven feet and three inches, shall be allowed or permitted to navigate either of the above named canals.

HEIGHT OF BOATS ALLOWED ON THE CHEMUNG CANAL.

No boat or other craft whose height or distance from the water line of such boat or craft, to the top thereof, shall exceed nine feet; and no loaded boat or other craft, whose cargo, or any part thereof, is so arranged or placed on such boat or craft, so that the top, or extreme height of the same shall exceed nine feet from the water line of such laden boat or craft; and no steamboat, tug, or other craft propelled by steam, whose height when the top of the deck, machinery, fixtures, of other apparatus, shall exceed nine feet, shall be allowed or permitted to navigate the Chemung canal.

OVERDRAFT OF WATER.

No boat drawing more water than the limit prescribed by the Canal Board shall be cleared by any collector; and it shall be the duty of every collector, superintendent, inspector and weigh master, to cause every boat found violating the regulations on this subject to be so far unloaded as to bring her within the prescribed limits, and in every case where a boat is so unloaded, the fact shall be entered on her clearance, with a statement of the portion of her cargo taken off; and if such boat shall be found to exceed the said draft, her master or owner shall be subject to a penalty of twenty-five dollars, to be imposed and collected by any and every collector, superintendent, inspector and weigh master, who shall at different times and places detect such overdraft.

COMMISSIONERS OF THE CANAL FUND.

[The Commissioners of the Canal Fund have the superintendence of the Canal Fund, and of the Canal Debt.]

Allen C. Beach, Lieutenant-Governor; Homer A. Nelson, Secretary of State; Asher P. Nichols, Comptroller; Wheeler H. Bristol, Treasurer; Marshall B. Champlain, Attorney-General.

CANAL COMMISSIONERS.

[The Canal Commissioners have the general charge of the public works, of the construction of new canals, and of the repairs of the completed canals.]

George H. Chapman, Ballston, in charge of Eastern Division, viz.: The Erie canal from Albany, including Albany basin, to east bank of the Oneida Lake canal; Champlain canal; Glen's Falls feeder, and the Black River canal and feeder, and improvement of Black River and reservoirs—315 miles.

W. W. Wright, Geneva, in charge of Middle Division, viz.: The Erie canal, from the east bank of the Oneida Lake canal to the east line of the county of Wayne, including the several feeders; Oswego canal; Cayuga and Seneca canal; Cayuga inlet; Chenango canal; Seneca river towing-path; Oneida river improvement; Chemung canal and feeder; Crooked Lake canal; Oneida Creek feeder; Oneida Lake canal; Baldwinsville canal—329 miles.

John D. Fay, Rochester, in charge of Western Division, viz.: The Erie canal from the east line of the county of Wayne to Buffalo, including the basins at Buffalo, and the Genesee Valley canal—280 miles.

STATE ENGINEER AND SURVEYOR.

Van Rensselaer Richmond prescribes duties of, and assigns divisions of canals to engineers; visits and inspects canals; prepares surveys, maps, plans, estimates, etc., in the construction or improvement of a canal, etc., etc.

THE CANAL BOARD.

The Canal Board consists of the Commissioners of the Canal Fund, the State Engineer and Surveyor and the Canal Commissioners.

Meets at the Canal Department during the sitting of the Legislature; fixes the rates of toll; appoints the engineers, superintendents of repairs, collectors of tolls, weighmasters, their assistants, and inspectors and measurers of lumber and timber, and of boats and their cargoes; and directs extraordinary repairs; hears appeals from the Canal Appraisers; remits penalties and regulates the police of the canals, etc.

CANAL DEPARTMENT.

Rooms in the State Hall, in which the business of the Commissioners of the Canal Fund and the Canal Board, and the business of the Auditor of the Canal Department, is required by law to be transacted.

G. E. Dayton, Auditor. [Invested with the powers and duties formerly belonging to the Comptroller, in relation to the canals; draws warrants on the Treasurer for all canal payments; audits all canal accounts; instructs canal collecting and disbursing officers; keeps account of canal receipts and expenditures, etc.; *ex officio* secretary of the Commissioners of the Canal Fund and of the Canal Board.]

CANAL APPRAISERS.

[They appraise the damage to individuals growing out of the construction of the canals. Office, State Hall, Albany.] Samuel North, George C. Greene, Jesse Gay.]

SUPERINTENDENTS—APPOINTED JANUARY, 1871.

NAMES.	Residence.	In charge of.
W. J. Wheeler.....	Crescent.....	Section No. 1, Erie canal.
Benj. Van Vranken.....	Schenectady.....	Section No. 2, Erie canal.
Daniel S. Read.....	Canajoharie.....	Section No. 3, Erie canal.
Daniel M. Golden.....	Frankfort.....	Section No. 4, Erie canal.
Charles Graham.....	New York Mills.....	Section No. 5, Erie canal.
Seymour Harvey.....	Durhamville.....	Section No. 7, Erie canal.
Abram Scouton.....	Fayetteville.....	Section No. 8, Erie canal.
Tunis Houghtaling.....	Port Byron.....	Section No. 9, Erie canal.
Wm. F. Ashley.....	Lyons.....	Section No. 10, Erie canal.
Matthew Rigney.....	Rochester.....	Section No. 11, Erie canal.
Lewis M. Loss.....	Albion.....	Section No. 12, Erie canal.
William McRae.....	Lockport.....	Section No. 13, Erie canal.
James Mooney.....	Buffalo.....	Section No. 14, Erie canal.
George W. Nelson.....	Mechanicsville.....	Section No. 1, Champlain canal.
George Satterlee.....	Fort Edward.....	Section No. 2, Champlain canal.
George Northrup.....	Comstock's Landing.....	Section No. 3, Champlain canal.
Ira Betts.....	Phoenix.....	Section Nos. 1 and 2, Oswego canal.
John Haggerty.....	Waterloo.....	Cayuga and Seneca canal.
Silas Haight.....	Elmira.....	Chemung canal and feeder.
Oliver G. Shearman.....	Penn Yan.....	Crooked Lake canal.
Joseph W. Forward.....	Bouckville.....	Section No. 1, Chenango canal.
Charles W. Oeldorf.....	Norwich.....	Section No. 2, Chenango canal.
Justus B. Wilmot.....	Owego.....	Section No. 3, Chenango canal.
Fred. M. Mills.....	Mt. Morris.....	Section No. 1, Genesee Valley canal.
James Lemen.....	Nunda.....	Section No. 2, Genesee Valley canal.
W. A. Kirkpatrick.....	Cuba.....	Section No. 3, Genesee Valley canal.
John L. Adams.....	Hinsdale.....	Section No. 4, Genesee Valley canal.
John Cole.....	Boonville.....	Section No. 1, Black River canal.
R. Sanford Miller.....	Constableville.....	Section No. 2, Black River canal.
Frank B. Johnson.....	Carthage.....	Section No. 3, Black River canal.

COLLECTORS.

New York.....	Charles F. King.
Albany.....	William C. Marshall.
West Troy.....	John Reiley.
Schenectady.....	George T. Castle.
Fultonville.....	Charles H. Quackenboss.
Little Falls.....	Henry Whittemore.
Utica.....	Henry Smith.
Rome.....	George Barnard.
Syracuse.....	Ezra L. Walrath.
Montezuma.....	Alanson White.
Palmyra.....	John F. Strain.
Rochester.....	Charles H. Stillwell.
Brockport.....	William H. Bunn.
Albion.....	Stephen Conner.
Medina.....	Adna Bowen.
Lockport.....	William S. Scoville.
Tonawanda.....	Velorous Smith.
Buffalo.....	George Talbot.
Waterford.....	Isaac N. Scouton.
Fort Edward.....	James R. Gandall.
Whitehall.....	Washington I. Smith.
Salina.....	John McCarthy.
Phoenix.....	
Oswego.....	
Geneva.....	John H. Mehan.

Watkins	Samuel W. Cass.
Horseheads	James S. Matthews.
Corning	Peter Reese.
Penn Yan	George D. Stewart.
Hamilton	James Thompson.
Oxford	Frederick B. McNeil.
Binghamton	George L. Lawyer.
Mount Morris.....	H. H. Scoville.
Dansville	Horace Wing.
Caneadea	James A. Jackson.
Olean	Robert H. Renwick.
Boonville	Joel T. Comstock.
Lyon's Falls	Albert J. Woolworth.

WEIGHMASTERS.

Albany.....	Bartholomew Judge.
West Troy	Frederick P. Fonda.
Utica	Clark Burnham.
Syracuse	John L. Cuyler.
Rochester	
Waterford	
Oswego	

ASSISTANT WEIGHMASTERS.

Albany.....	Andrew Kean.
"	John Mulholland.
West Troy	John B. Latta.
"	John M. Galligan.
"	James H. Burns.
Utica	Adam Scheehl.
"	Earl R. Johnson.
Syracuse	Augustus Norton.
"	Lucas Elsasser.
"	James Delamater.
Rochester	
"	
Oswego	
"	
Waterford	David L. Baker.
"	Philip Donohue.

INSPECTORS AND MEASURERS OF LUMBER AND TIMBER AND OF BOATS AND THEIR CARGOES.

New York.....	John R. Mallory.
"	John Petit.
Albany.....	George Hill.
"	David Prest.
West Troy	Thos. P. Richards.
"	Patrick Regan.
Utica.....	Michael Shields.

Syracuse	Garret Putnam.
Rochester	
Buffalo	John Rodney.
"	Peter Krull.
Oswego	
"	
Whitehall	Luke H. Carrington.
Tonawanda.....	Joel Rogers.

CIRCULAR TO SUPERINTENDENTS OF CANAL REPAIRS.

CANAL DEPARTMENT, ALBANY, April, 1870.

To the Superintendents of Canal Repairs on the New York State Canals:

It has been usual hitherto to issue circular letters from this department explanatory of your duties, in order that you may thereby, to a certain extent at least, be informed of what will be expected of you by this department. In preparing the following instructions, I have, to a great extent, adopted those of my predecessors, varying them where it appeared necessary to conform to changes in the laws and duties of your office.

Section 1, chapter 57, of the Laws of 1851, expressly provides that "Superintendents appointed by the Canal Board on the several canals of this State shall give their *personal* and *constant* attention to the duties of their office."

It is not competent for you, therefore, to perform your duties by proxy, or to be engaged in any other business that requires your personal attention. It is an office that requires vigilance and activity. The interests committed to your care are great, and a little negligence on your part may be the cause of great damage. You will do great injustice, therefore, to the State, and yourself also, if you assume to enter upon the duties without a firm determination to give the State your prompt, energetic and undivided attention to the duties of your office.

It is made your duty as such superintendent, under the direction of the Canal Commissioners, and particularly of the Commissioner who has charge of the line of the canal on which you are employed, to keep in good repair the canal and the public works committed to your charge; and you are, under the advice and direction of the Commissioner, to make all necessary contracts in the manner hereinafter stated for that purpose, and faithfully to expend all such moneys as shall be placed in your hands by the Canal Commissioners and the auditor. Sections 99, 100, 101, 102 and 103, on page 286, vol. 1, of the first edition of the Revised Statutes, contain an enumeration of some of the most important of your duties, and I therefore copy them at large:

"§ 99. Each superintendent of repairs, and every collector of tolls, before he shall enter on his official duties, shall execute and file in the office of the Auditor a bond, for the faithful execution of his trust, in such penalty and form as the Canal Board shall direct, and with such sureties as the Auditor shall approve.

"§ 100. It shall be the duty of each superintendent, under the direction of the Canal Commissioners, to keep in repair such sections of the canals, and works connected therewith, as shall be committed to his charge; to make all necessary contracts for that purpose, and faithfully to expend all such moneys as shall be placed in his hands by the Canal Commissioners or the Commissioners of the Canal Fund.

"§ 101. Each superintendent shall be under the direction of the Canal Commissioners, and especially of the acting commissioner having charge of the line of the canal on which such superintendent is employed.

"§ 102. Each superintendent shall, as often as once in sixty days, render his account to the Auditor, who shall audit the same; and if any superintendent shall omit to render his account, or his account as rendered be not satisfactory, the Auditor shall notify the Canal Board and the Commissioners of the Canal Fund thereof, and no further advances of money shall be made to such superintendent, but he shall be immediately removed from office.

"§ 103. Before any superintendent's account for expenditures shall be presented to the Auditor, the Canal Commissioner having charge of that part of the canal on which such superintendent is employed shall certify, on such account, that he has examined the same; that the several disbursements, specified therein, were made under his direction on the canal, or for repairs necessary to be made thereon; and that he believes such disbursements to be proper and reasonable, and to have been made as charged."

You are under the necessity, from time to time, of purchasing materials and employing hands for the repair of the canal; and as it is, and always has been, the policy of the State to pay as soon as the materials are furnished or the service rendered, provision has been made to place money at the disposal of the superintendent for this purpose. The seventh and eighth sections of "An act in relation to the canals," passed May 16, 1837, provides as follows:

"§ 7. Before any advance of money shall be made to a superintendent of canal repairs, by the Auditor, he shall make out a detailed statement, in such form as the Auditor shall prescribe, of the several anticipated objects of expenditure on the line of canal under his charge.

"§ 8. If the said estimate shall be filed in the office of the Auditor, with the certificate thereon of the Canal Commissioner, stating that in his opinion the whole amount, or if less than the whole amount, what portion of the said estimate should be advanced, the Auditor may make advances on the same, in such sums and as often as he may deem necessary; provided such advances shall not exceed the amount certified by the Commissioner."

This money is to be advanced to you on satisfactory evidence that it is required for the repair of the public works. And in order that the Auditor may have a reasonable foundation for an opinion that the advance asked for by the superintendent is "required in the execution of his duties," it is necessary that you should, previous to asking for such advance, carefully examine every part of your line of the canal, and make out a full and detailed statement of all the repairs required to be made, and the sums which, in your judgment, it will be necessary to expend upon them for the ensuing sixty days. In this estimate the location and character of the work, on which the expenditure is to be made, should be given with such minuteness and precision as to enable the Commissioner to trace every dollar of the public money to some portion of the public work.

1. If a bridge is to be repaired or rebuilt, the estimate should give the expense of removing the old and preparing for the new foundation, the quantity and cost of the stone and lime, the expense of the mason work, the quantity and cost of the timber, the planks, the board, the iron work, etc. If an aqueduct, a culvert, a lock or any other structure, requires to be repaired or rebuilt, its location should be given, and a minute estimate made of the kind, quantity and cost of the different materials necessary to be used. If there are materials on hand suitable for the contemplated work,

the quantity and amount paid for the materials on hand should be stated, and deducted from the estimated cost of the structure.

2. The same particulars should be given in relation to each repair which has been commenced and remains unfinished.

3. The tools, implements and apparatus to be purchased, and their probable cost.

4. The sum necessary to pay lock tenders, according to the contracts with them for their wages, expense of lamps, etc.

5. The sum necessary to be paid during the sixty days, to each contractor on your line.

6. If the tow-path is to be raised, or any work is to be performed which is not contracted for, the location and character of the work should be given, with a detailed estimate of the expense of doing it.

The estimated expenditure upon each bridge, culvert, etc., should be shown separately, and the total sum required for the sixty days should be given in a general footing. The regulations prescribed for the estimate under the act of 1847, are as follows :

"That every superintendent of repairs on the canal, in order to obtain an advance of moneys to be expended on the canal, shall make out a detailed statement of the several objects of expenditure for the next sixty days, so far as he can anticipate the same, stating whether for building bridges, repairing aqueducts, graveling the tow-path, the pay of lock tenders, teams and laborers, the purchase of materials, tools and the like, and may add to the estimate a separate sum for contingencies, and shall deliver two copies of the said estimate to the Canal Commissioner. On one of the said copies the Commissioner shall certify what amount in his opinion ought to be advanced, which estimate and certificate shall be filed in the canal department, on receiving the balance; the other copy of the estimate shall be retained by the Commissioner, to be used on the settlement of the accounts of the superintendent, at the end of sixty days."

You are required to open an account as superintendent, and separate and distinct from your individual concerns, with some bank, in which the advances made to you by the Auditor of the canal department are to be deposited.

You will be furnished by the bank, where you keep your account, with a check and bank book, the latter of which you are required to have written up at least once a month. The check book you will of course confine to your account as superintendent; and by entering in it, upon the blank margin, opposite to the check, the sums advanced to you from time to time, you will be able at any moment to tell the amount you have in bank.

The payments which you are to make upon your line of canal may be classed under five general heads, viz.:

1st. Payments to lock tenders, which are in each case for a price certain for a month, or for two months, and the total amount of which for those periods can almost always be known with precision.

2d. Payments to regular and permanent hands under foremen who keep check rolls, and the amount necessary to pay whom for a month can, by information from the foreman a few days before the close of each month, be told with almost as much accuracy as that of the lock-tenders.

3d. Payments for materials for repairs, including payments on contract.

4th. Payments for tools, etc., being mostly merchants' and smiths' bills.

5th. Miscellaneous payments.

By a compliance with the requirements of this circular, you will always have it in your power to have to your credit, in the bank where you shall keep your account, funds sufficient for the necessary expenditures on your line of canal. And while provision is thus made for your public expenses, which will prevent the necessity of your ever having recourse to your individual credit to meet them, you will consider the funds so placed at your disposal, as sacred to the uses of the canal, and that they are to be drawn from the bank no faster and in no larger sums than the necessity of payments absolutely requires. Thus, in relation to the payments of the 1st and 2d class, it is not conceived to be necessary that the moneys to make them monthly, which is as often as they will be made, need be drawn by you from the bank until near the expiration of the month in which the service shall be performed.

Payments of the third class and their amount cannot be anticipated with equal precision, but they can sufficiently so to render it unnecessary that you should have any considerable sum in your hands at once to meet them.

Payments of the fourth class are generally delayed by the superintendent until the close of the sixty days. Those with whom you deal to any extent, and with whom you have a running account, if they are certain of receiving their pay at the end of sixty days, would willingly delay presenting their bills until that time. Thus payments of this class will not, generally speaking, have to be made until the close of the two months.

For payments of the fifth class, as they cannot be foreseen, and for such of those under the other heads as are of the same character, you will of course have to be provided with funds in your hands to the necessary amount.

The canal moneys being on interest in the deposit banks, it is expected that a superintendent will not make his drafts any oftener, nor in larger amounts, than a just regard to the public wants shall render necessary.

It is supposed, as a general rule, that not more than one-fourth part of a certified advance will be wanted by a superintendent before the middle of the first month, one-fourth part at the close of the month, one-fourth part by the middle of the second month, and the residue at the close of that month. By this manner of drawing for the advance, a superintendent never need be subjected to any delay in making his payments, if his estimate be duly filed in this department, as his deposit bank will always be willing to take his drafts on the Auditor.

The proportions of the advance, and the periods when to be drawn for, may be varied by circumstances; and should it be necessary to draw for a much larger proportion of the advance, at any one time, than as above specified, *a letter containing the reasons therefor* should be written in time to be received here previous to the presentation of the draft for payment.

By a resolution of the Canal Board, no superintendent of repairs is allowed to keep his official account at a bank which shall advance to him moneys beyond the amount for which the bank shall have advice from the Auditor that the superintendent's drafts on the Auditor will be paid.

To enable superintendents to comply with all the requirements of this circular, the Canal Board have authorized the Commissioner to allow superintendents in charge of sections not in the hands of repair contractors, such an amount for clerk hire as in his opinion shall be necessary.

This will enable you to keep the necessary accounts, and to make the prescribed estimates, reports and contracts, and the necessary copies thereof.

By keeping a separate account with every contract, with every lock tender, and with every separate job of work, such as a bridge, a lock, a culvert, an aqueduct, in

which each structure shall be charged with the quantity and cost of the stone, lime, timber, etc., excavation, embankment, mason work, carpenter work, iron, etc., etc., and also by keeping the check book or cash account, the bank book, etc., as required in the preceding part of this circular, you will be enabled at any time during the second month, by a careful examination of all these accounts and of all the work which is going on under your supervision, to form an accurate estimate of the sum required to close up your accounts at the end of the sixty days. This examination should be made several days before the close of the second month, and in time, if it becomes necessary, to write to and get an answer from the Auditor, previous to the close of two months.

If you ascertain that you have money enough to pay all claims against you as the agent of the State, up to the time at which you are required to render your accounts, it will not be necessary for you to pursue the course hereinafter prescribed; but if, on examination, you find that the money to pay off the claims at the end of the sixty days will fall short, you should make an additional estimate and satisfy the Commissioner of the situation of your accounts and money, and obtain from him the usual certificate for a further advance, to enable you to close up your accounts. When you ask this certificate of the Commissioner, you should exhibit to him your bank account and your expenditures, and such estimate as will enable the Commissioner to judge of the necessity of the advance.

You are not to pay out the public money without taking a receipt, dated at the time of payment; you are not, under any pretense whatever, to take a receipt without paying the money to the full amount of the receipt taken. You are not in any case to give notes or due bills to any person who has furnished materials or rendered service to the State.

A mode of transacting business, which will only be practiced by those who wish to speculate on the public money, instead of paying it to those who have earned it, must eventually result either in a fraud upon the treasury or upon the individual who signs the receipt. To prevent either of these results, each superintendent is required to make oath that the money has actually been paid for every receipt which he asks to have credited to his account.

In the Laws of 1851, chapter 57, section 2, it is enacted that "No superintendent appointed as aforesaid, shall, under any pretense whatever, take a receipt for labor done, services performed or materials furnished for the canals, when the money shall not be actually paid."

And in the first section of chapter 310 of the Laws of 1842, it is expressly required that "proof in some apt form shall be furnished on oath that it (the voucher) was so filled up at the time it was taken, and that the money, mentioned therein to have been paid, was in fact paid in cash, or by draft on some specified bank."

Every voucher taken by a disbursing officer should contain a brief and true history of the transaction between the agent of the State and the individual who signs the voucher; if it is for labor, the account should give the number of days and the date of commencing and ending; the price per day or month; and if the voucher covers the services of any person who does not sign the receipt, the account should give such explanation as to show that the person signing the receipt had a legal right to receive and receipt for the money. For instance, if a man is employed with his son, who is a minor, or with an apprentice, the fact should be stated, and the sum for the pay of the minor or apprentice carried out in a separate line, with the price per day or month. But in all other cases the money should be paid to and receipted by the person who does the labor; and in no case should one man be allowed to

hire hands to labor for the State, and receive the pay for such labor. All laborers should be employed by the superintendent, and the money paid to the person thus employed, or to his written order, and not to any other person.

If a disbursing officer adheres strictly to the rule of embodying in each receipt the simple truth in relation to the transaction between the State and the person signing it, he cannot be embarrassed in the settlement of his accounts. Justifiable deviations from prescribed forms may be explained or excused; but deviations from fact in a voucher destroys its validity, and an explanation, by disclosing the real facts of the case, instead of excusing the officer, tends to cast suspicion either upon his integrity or his capacity. The practice of allowing a person hired by the month to receipt for a team driven by him, but which belongs to another person, is wrong, although the interests of the State may not be affected, for the simple reason that the voucher does not give a true relation of the transaction. Such a voucher, however, may be rendered valid by a writing from the owner of the team, authorizing the driver to receipt for the use of it.

To every voucher of merchants, mechanics and miscellaneous accounts, in which are included articles purchased or services rendered, not paid for on delivery of articles or at time of rendition of service (and which is intended especially to include running accounts of every description), all accounts for labor not included in check rolls, all bills left unpaid by your predecessor, which you may be authorized or directed to pay, must be verified, before payment, before yourself or some officer authorized to administer oaths, which affidavit must be attached to the voucher and returned therewith to this department. The following form of affidavit has been prepared for such purpose. As it is desirable that at the expiration of each sixty days the department should be furnished with the full amount of expenditures during such period, there will be required in cases of all vouchers, including any item or charge accruing at a date anterior to the last abstract of expenditure, to be added to the affidavit a statement or explanation of the reasons why the same was not previously presented or paid:

STATE OF NEW YORK, } ss:
COUNTY OF ,

A. B. (or if a firm, say A. B., one of the firm of C. D. & Co., named in the annexed account), of , in the county of , being duly sworn, saith that all the items in the annexed account are correct, and accrued at the dates respectively as stated therein; that no part of the same, or any item therein, is charged at more than its fair value; that it is a just claim against the State of New York to the amount of dollars and cents, specified therein; that no part thereof hath been included in any former bill rendered against the State; that there are no legal or equitable offsets against the same; that the same, or any part thereof, hath not been paid to this deponent or any other person, by or in behalf of said State, to the knowledge, information or belief of this deponent; that this deponent is (or if a firm, say that the said firm are) the lawful owner of such account, and entitled to the payment thereof. And further, that all the labor charged therein has been applied upon the works and to the benefit of the State; and that all the property charged therein has been delivered to the duly authorized agents of the State, and, according to the best of the knowledge, information and belief of this deponent, used for the benefit of the State, by or under the direction of one of the authorized agents thereof.

FOREMEN AND ROLLS.

Industrious and faithful men ought to be employed as foremen, on whose fidelity reliance can be placed to keep the roll with such accuracy as to do justice to the individual as well as to the State. The roll should be made up at the end of every month, and the number of days for which each person has labored should be carried out opposite his name, with the price per day or month, and the total sum due him; and the roll, thus made out, should be read in the hearing of each laborer, or at least the foreman should state to each laborer the number of days, the price and the total sum entered on the roll opposite his name. When the roll is thus made out, and the sums footed up, the truth of it is to be verified by the oath of the foreman, in the following form :

STATE OF NEW YORK, } ss.
COUNTY OF }

of , a foreman under , superintendent, being duly sworn, saith that the foregoing check roll, the total number of day's labor entered on which is , was kept by him as foreman of the laborers and teams entered thereon; and that he has himself (and has good reason to believe that the several other persons and the teams entered upon said roll have) performed the labor in the service of the State for the whole number of days and parts of days stated in said roll, and at the prices entered opposite each name and team respectively; and that the description of each work, and the number of days on each work, as entered on said check roll, is in all respects just and true, according to the best of his knowledge and belief.

A. B., *Foreman.*

Subscribed and sworn to, this }
day of , 187 , before me, }

C. D., *Superintendent of Canal Repairs.*

If the labor has not in all cases been performed under the inspection of the foreman, so as to enable him to swear positively that it has been done, he can make such exceptions as the case requires.

It is desirable that the oath be administered in all cases by the superintendent. If the superintendent is not present, the roll may be sworn to before any judge, justice or commissioner.

The roll being thus verified, you should yourself pay to each individual the sum due him according to the roll, and take his receipt therefor, which should be dated on the day of the transaction.

The receipts should be numbered, commencing with the first name on the roll for No. 1, and numbering them in the order in which the names stand on the roll. These receipts, without being folded, should be arranged according to their numbers, and carefully folded in the check roll, which should be filed on the outside of the roll, with the name of the foreman, the month embraced in the roll, and the total amount paid on it.

This roll, covering the receipts of all the laborers under one foreman for a month, will occupy only one line, or the space of a single voucher, on the abstract of the superintendent, and will be numbered on the outside, with reference to the other vouchers entered upon the general abstract. The entries upon the check roll should be confined exclusively to the labor of the hands employed by the State, and the service of teams where they are furnished. The foreman and hands employed by

the month are not allowed to furnish materials, and therefore the roll will be confined to their labor; and, if the same individual who is temporarily employed with his team has also an account for materials furnished, the receipt for materials should be entered separately on the abstract of the superintendent.

Your accounts being prepared as above directed, and having made yourself sure that you have made all the payments and procured all the vouchers for the two months, you are to enter at the bottom of the abstract the one-sixth part of your salary, which you are to retain at the closing of each account. In this shape you are to lay the accounts before the Canal Commissioner upon your line, and his signature to the certificate, required from him, must be obtained before the accounts can be allowed, or even examined at this office. This should be done as soon after the close of each two months as is possible; and that you may be prepared to lay the accounts before the Commissioner, without delay to him, you should have the vouchers taken, and in order, and the abstract completed immediately after the expiration of the last month.

When all the vouchers and the amount of your salary for two months have been entered upon the abstract, and the general statement of your account is made, according to the form on the abstract annexed, the whole is to be verified by your oath, in the following form:

STATE OF NEW YORK, } ss:
COUNTY OF , 18 }

, Superintendent of canal repairs, having charge of the line of canal specified in the above abstract, doth solemnly swear that the foregoing is a true abstract of all the vouchers taken by him as such superintendent for the days ending on the day of , 187 ; and doth further swear that the money specified in the several receipts, of which the above is an abstract (except vouchers marked A, paid by agent), has been actually paid, as specified in said receipts, in cash or by check on the bank; and further; that all the receipts, not specifically excepted, were each and every of them filled up as they now appear before they were signed; and he doth further swear that, according to the best of his knowledge and belief, all the labor has been performed, services rendered and materials furnished for the benefit of the State, and the State alone, and at as fair and reasonable prices as the same could be procured; and further swears that all fines, penalties and forfeitures collected, and the sales of public property made during the period aforesaid on the line of canal under his charge, are, according to the best of his knowledge and belief, correctly entered on the said abstract.

Subscribed and sworn to before me this }
day of 18 }
 , Commissioner.

[In the absence of the Comissioner, the oath may be taken before any judge, justice or commissioner.]

If from sickness, or any other cause, you are unable to go through your line and make the payments yourself, as you ought to do when you are able, you must then make such exceptions in the oath as the case requires, making a note on the back of each receipt, stating by whom the money was paid, and furnish an affidavit, to supply the deficiency, from the agent whom you shall have employed to go through the line for you and make the payments. Those who keep the rolls should not be furnished with money to pay the hands on their rolls. There have been abuses

under this practice which make it necessary to discontinue it, except in special cases; and then an explanation of the circumstances should be given to justify a deviation from the rule.

REPORT AT THE END OF SIXTY DAYS.

At the close of the sixty days, in addition to the rolls of your foreman, and the receipts and abstract, you should prepare a full report, in the same order in which the estimate was made, showing the expenditure upon each structure, repair or job, and the separate cost of the labor and the different kinds of materials used, and the cost of all the materials furnished and work done on the line for the sixty days. If the cost of any culvert, bridge or other expenditure differs materially from the original estimate, the cause of such difference should be explained. Such report of expenditure should include all your expenditures during such sixty days; and no bills or accounts should be left unpaid to be included in any subsequent report.

PURCHASES, BY WHOM MADE.

There has been a practice tolerated by some of the superintendents of allowing foremen, lock tenders and others to make purchases on the credit of the State. All purchases should be made by the superintendent personally, or on his *written order*, and not otherwise. The superintendent is furnished with money to pay for everything which is required for the repair of the canals, and as soon as any work for the State is done, it should be promptly paid for; and, at all events, the persons employed by the superintendents should not in any case be allowed to purchase articles for the canal on the credit of the State.

APPOINTMENTS OF SUBORDINATES.

Chapter 57 of the Laws of 1851, section 3, confers upon you the power to appoint subordinates, and I therefore insert herein such section at large:

"Each superintendent so appointed shall have power to appoint his own foreman, lock tenders and other subordinate persons necessary to enable him to discharge his official duties, and the compensation to each shall not exceed the rate of compensation established by the Board of Canal Commissioners; but the Canal Commissioner in charge of any section of the canal in which any foreman, lock tender or other subordinate person may be employed, or the Board of Canal Commissioners, shall have absolute power to remove any foreman, lock tender or other subordinate for misconduct, incompetency or neglect of duty, provided such Canal Commissioner or the Board of Canal Commissioners making such removal shall specify the cause of such removal in writing, and file the same in the office of the Auditor of the canal department within ten days from the date of such removal. In case of the removal of any such foreman, lock tender or other subordinate, it shall be the duty of the Commissioner or the Board of Canal Commissioners making such removal immediately to notify the superintendent in charge of the section of the canal where such removal shall be made of the fact of such removal; and in case the superintendent shall neglect or refuse, for three days, to fill the vacancy thus created, and to notify the Commissioner or Board of Canal Commissioners thereof, it shall be the duty of the Canal Commissioner or the Board of Canal Commissioners making such removal to fill such vacancy."

LOCK TENDERS.

In the employment of lock tenders, you should employ such men only as will give their personal attention to the business, and under no pretense should a contract for tending locks be made with a person who intends to sub-let or farm it out; and if any person, after his appointment as a lock tender, does not give it his personal attention, or sub-lets or farms it out in any manner, you are required forthwith to remove him, and appoint another who will properly attend to his duties.

The lock tender has the power of determining as to the preference between boats in passing a lock; and he ought not only to be in attendance himself, but he should be a sober, honest and discreet man, who can be relied upon to decide these questions promptly and impartially.

Lock tenders are prohibited, by a resolution of the Canal Board, from being concerned in any grocery on or near the canal. You are particularly required to see that this resolution is strictly complied with.

It is alleged that some of the lock tenders on the canal have been in the habit of receiving presents of wood, etc., from boatmen; and it is inferred that those who receive such favors repay them by giving to such persons an undue preference at the lock. The lock tender should in no case place himself in a position which will expose him to the suspicion, on the part of a boatman against whom he may decide, that his decision is influenced by any benefits conferred by the person in whose favor he may decide. The practice alluded to is as objectionable as it would be for a magistrate, on the trial of a suit between two neighbors, to receive a present from either of the parties; a right decision, under such circumstances, would not protect the magistrate from the suspicion that his mind was biased by the favor conferred; at least this would be the opinion of the defeated party, under a feeling that his cause was a just one.

Every suit commenced by a lock tender should be immediately reported to the superintendent; and all fines collected should be accounted for at the close of each month, and the particulars of each case should be entered in the books of the superintendent, and the moneys received should be accounted for in his first settlement after the transaction.

If any suit is to be carried to a higher court, the particulars of the case should be reported to the Auditor in the same manner as is required in relation to suits commenced by the superintendent himself.

As soon as the lock tenders are appointed on your line, you are requested to send a list of their names to the Auditor, the number of the lock or locks in charge of each, the pay per month or the amount of the contract with each person. This will enable the Auditor to estimate how much you require per month for lock tending, and when you require it, as payment can only be necessary monthly.

CONTRACTS.

All contracts for materials or jobs made by you should be in writing, and duly executed by the parties, and an account opened in each case on the books of the superintendent; no contract should be made or important improvement undertaken by you without the express approval and ratification of the Commissioner, and such approval or ratification of a contract should be signified by a certificate or indorsement on the contract. As soon as the contract is executed, notice should be given to the Auditor, stating the substance of the contract, the name of the contractor, and such particulars as will enable the Auditor to form an estimate of the amount of

money required to complete the payments on the contract; the contract itself should be sent to the Auditor, with the voucher for the first payment under it. If other payments are to be made on the same contract, the superintendent can retain a copy of it for his use. The return alluded to will aid the Auditor in determining, when an advance is asked for, whether it is required to meet engagements made on behalf of the State.

You are prohibited by a resolution of the Canal Board from participating in any contract on the canals. This prohibition extends to all materials, tools or implements for the use of the canals, or any transaction by which you shall, directly or indirectly, be benefited by any of the money disbursed by you as superintendent. You cannot properly allow any contractor to take timber or materials from your land and receive a compensation therefor; and you should not do indirectly, through any relatives or friends, what you are not allowed to do directly by the law, the regulations and your instructions.

So far as you have it in your power, you should extend the same prohibition to your foremen, lock tenders, and all other persons employed by you on the State work. You should make no contracts with those who are employed in the service of the State, by the month, or any fixed period, for the supply of materials in repairing the canal. Any bargain of this kind, on the part of a lock tender or a foreman is entirely inconsistent with his previous contract, to give the State his whole service as such foremen, lock tender or laborer.

The fact has been disclosed, on the trial of one superintendent, that persons who were paid almost constantly for serving the State, were at the same time used as the instruments in buying off bidders for a contract, and getting possession of a job under a higher bid; thus depredating upon the State instead of serving it faithfully as they were bound to do, while they were retained from month to month, if not from year to year, in its service.

All contracts for repairs or improvements, directed by the Legislature or the Canal Board, must be made in writing, and public notice must be given that sealed proposals will be received for entering into such contracts. The ordinary repairs of a canal may be made without a special contract. But in all cases where the execution of a job, not directed by the Legislature or the Canal Board, can as conveniently be done by contract as those improvements which are thus directed, the State should have the benefit of the competition provided for in the law.

It is considered that all work which is susceptible of measurement should be done by written contracts at specified prices. Sufficient public notice should be given for sealed proposals for all contracts, and in such manner as the Commissioner may from time to time direct.

ANNUAL REPORT OF PROPERTY IN CHARGE OF SUPERINTENDENTS.

You are required to make an annual report, giving a schedule of all the property belonging to the State on the line of canal under your charge. This will require you to keep a memorandum of every article purchased for the use of the State, and of all tools or implements which are worn out, broken or lost, in order that you may, on the first day of January in each year, render a satisfactory account of the property on hand, compared with the previous schedule, and the purchases between the periods of making the two reports.

OLD MATERIALS, HOW DISPOSED OF AND ACCOUNTED FOR.

Whenever aqueducts or other structures are repaired, the utmost caution and strictness should be observed in relation to the old materials. These materials, of every description, if not necessary to be preserved for the use of the State, should be sold to the highest bidder, after giving reasonable public notice of the sale. The proceeds of such sale should be reported and accounted for at the close of the sixty days in which the sale is made. And you should, in thus reporting it, specify the time and place when such sale was made and the notice that was given thereof. The superintendent should not himself be interested in any purchases of public property sold on the line of the canal.

Whenever paddle-gates, or any of the iron work connected with the locks, are replaced, the lock tender should be held responsible for the safe keeping of the old article, which, if it cannot be repaired and used, should be disposed of by the superintendent for the benefit of the State, and accounted for by him.

SUITS FOR PENALTIES, ETC.

The superintendents, in a great variety of cases, are authorized to sue in the name of the people, for penalties for violations of the canal law and the regulations of the Canal Board. Where the superintendent is sued, or commences a suit before a justice, if the suit is to be carried to a higher court by either party, a full statement of the case should be made and sent to the Auditor, in order that the advice of the Attorney-General may be obtained before a heavy bill of costs has been made for the State to pay. Claims for costs, unless a sum sufficient for the purpose is recovered, cannot be paid until they are examined and allowed by the Commissioners of the Canal Fund, as required by law.

BREACHES.

Whenever there is a breach in the canal, you should immediately give notice of it to the Auditor as well as the Commissioner. If money will be required to enable you to pay off the hands employed on the breach, you should state the facts in your notice to the Auditor. As soon as the breach is repaired, the Auditor should be informed of it, and of the expense incurred. This is desirable, as well on account of having authentic information in relation to the condition of the navigation, as on account of the expenditure for the repair.

Timely examinations of the structures connected with the public works, and unremitting vigilance on the part of the superintendent and those employed under him, may, in almost every case, prevent breaches. Where they take place, and a heavy expense is incurred by the State, and the trade of the canals is interrupted, it is important that the superintendent and those under him should be enabled to show that the occurrence is not attributable to any neglect on their part.

Last season was one peculiarly unfortunate in regard to breaches, and it is believed that the most part, if not all of them, could have been avoided by proper care and attention on the part of the superintendents and their subordinates. With proper watching and regulation of the levels, breaches in the canals seldom, if ever, need occur; and you will be expected to use every means within your power to protect against them. The canal board, believing that they are generally more the result of negligence than unavoidable accident, have directed me to notify you that they will hold each superintendent to a rigid accountability for any breaches that may occur upon his section; and will act upon the principle that a superintendent who cannot, except under very extraordinary circumstances, protect the canal from breaches, is *incompetent* for the charge.

ANNUAL REPORT OF THE

PUBLICATION OF MONTHLY ABSTRACT.

The law passed in March, 1853, being chapter 52 of the Laws of that year, which requires you to publish monthly abstracts of your disbursements, provides that "the expense of such publication shall not exceed the sum of fifteen dollars, to be regulated and fixed by the Auditor of the Canal Department." Taking the experience of former publications, I have concluded to fix the rate of compensation, applicable to all papers, at seventy-five cents *for each sixteen lines of an ordinary newspaper column*, which, for the Evening Journal and Argus, of this city, is called a square. Experience thus far shows that, at that rate of compensation, the expense of three-fourths of the publications would not average more than about nine dollars per month, while the average of the largest would scarcely exceed fifteen dollars per month.

It must, of course, be understood that you cannot pay more than fifteen dollars for a single month. If, at the rate fixed, it would amount to more than fifteen dollars, and no paper will publish it, then you are to file it as directed by the law.

Almost all the papers follow the form prescribed, and confine the publication to the width of a column. A few occupy the width of two columns. In such cases the pay will be for only one-half the space occupied, and at the rate mentioned.

NOT TO RETAIN MONEY BELONGING TO WORKMEN.

You should not retain in your hands the money belonging to the workmen, or any of them, although they may request you to do it for their use and benefit. If any of them desire to deposit their money with you for safe keeping, you should decline receiving it; being the agent of the State, you cannot accept these trusts from those who work for the State without creating in their minds the belief that in this transaction, also, you are in some degree acting in your official capacity, and that the State ought to be responsible for your acts.

You have a high responsibility cast upon you; and the interests of the State, as well as the interests of those who navigate the canals, are to be affected favorably or unfavorably by the manner in which you discharge your duties. You cannot do justice to the public or to your own character without being constantly on the line of the canal, and devoting your whole energies to the public service.

Money is placed in your hands, to an immense amount, with the confident reliance that you will faithfully expend it in paying those who have furnished materials for the canal or rendered service to the State. Beyond the amount of your own salary, which you are allowed to receive every two months, you should not permit yourself to use a dollar of the public money for private purposes, under any pretense whatever.

CLERKS, ETC.

Such superintendents as are allowed clerks will appoint such clerks subject to removal by the Canal Commissioner, who will also determine the amount to be paid them for their services.

You will receive from your predecessor, the late superintendent of repairs, all books, blanks, papers and other property belonging to the State, which he may have in possession, rendering a receipt therefor, and send a copy of such receipt to this office.

PATROLMEN.

Act chapter 55 of the Laws of 1870 authorizes the Canal Board to appoint as many patrolmen as it may deem necessary to act as a police along the canal, and

enforce the canal laws and regulations. Section six of said act further provides that "such patrolmen shall be assigned to such portions of the canals as the Commissioner shall direct, and shall be subject to and under the control of said Commissioner and the officer in charge of the repairs of such portion of the canal."

The regulations in regard to patrolmen adopted by the Canal Board, June 16, 1870, provide, among other things, that "it shall be the duty of such patrolmen to pass over that portion of the canal assigned them daily, and oftener, if necessary, to see that the levels are kept at a proper and uniform height; that water is not unnecessarily wasted, or wrongfully taken from the canal; that timely warning is given to the repair agents of leaks or other dangers to the canal; that the locks are well and properly attended; that boats are not overloaded; that boatmen keep their boats moving, and in such shape at all times as not to in any way or manner obstruct the flow of water or navigation."

You are therefore required to exercise such supervision and "*control*" over the patrolmen that have been or may be regularly appointed and stationed upon your section of the canal, as will secure from them the faithful performance of their duty, and enable you to render to the Commissioner in charge a truthful account of the number of days each patrolman has served the State during the preceding month.

You will carefully preserve all circulars, pamphlets and printed directions which you may, from time to time, receive from this office, and carefully place the same on file.

Yours, respectfully,

JAMES A. BELL, *Auditor.*

ANNUAL REPORT OF THE

AN ABSTRACT of expenditures by A. B., superintendent of repairs upon the charge of miles of solid canal, extending from days commencing on the 1st of April and ending on the 31st of May, 1870.

*canal, and having
for the sixty*

FORM—(*Continued*).

Balance from last abstract due the State (or due me, as the case may be)	\$40 00
Deposited since that abstract my drafts on the Auditor of the Canal	
Department to my credit in the	<u>bank.. 2,920 00</u>
	<u>\$2,960 00</u>
Expended as per abstract.....	<u>2,624 98</u>
 Balance	<u><u>\$335 07</u></u>
Of this balance there is in bank.....	<u>\$300 00</u>
Of this balance there is in hand.....	<u>35 07</u>
 Total in bank and in hand, equal to balance above...	<u><u>\$335 07</u></u>

C. D. *Superintendent of Canal Repairs.*

Dated this 2d day of June, 1870.

STATE OF NEW YORK, } ss :
COUNTY OF }

, Superintendent of canal repairs, having charge of the line of canal specified in the above abstract, doth solemnly swear that the foregoing is a true abstract of all the vouchers, taken by him as such superintendent, for the days ending on the day of , 187 ; and doth further swear that the money specified in the several receipts, of which the above is an abstract (except those marked " A " on the back as having been paid by agents), has been actually paid as specified in said receipts, in cash or by check on the bank ; and further, that all the receipts, not specially excepted, were each and every of them filled up as they now appear before they were signed ; and he doth further swear that, according to the best of his knowledge and belief, all the labor has been performed, services rendered and materials furnished for the benefit of the State, and the State alone, and at as fair and reasonable prices as the same could be procured ; and further swears that all fines, penalties and forfeitures collected, and the sales of public property made during the period aforesaid, on the line of canal under his charge, are, according to the best of his knowledge and belief, correctly entered on the said abstract.

C. D., *Superintendent.*Subscribed and sworn to before me this
day of , 187 . }A. B., *Canal Commissioner.*

[In the absence of the Canal Commissioner, the oath may be taken before any judge or commissioner.]

I certify that I have examined the preceding abstract, and the vouchers of which it is an abstract, amounting to dollars and cents ; that the several disbursements specified therein were made under my direction on the canal or for repairs necessary to be made thereon, and that I believe such disbursements were proper and reasonable, and have been made as charged in the said abstract and vouchers.

[Signed]

A. B. *Canal Commissioner upon that part of
the canal described in the heading of the above abstract.*

Dated 6th day of June, 1870.

NOTES.

Vouchers and check rolls should be entered invariably in the order of the dates. Both sides of their sheet are to be written upon. No. 7 is to be equal to the footings of all the columns from No. 2 to No. 6, inclusive.

Should a voucher contain articles or matter that would come under two or more of the above heads, put the true amount under each head, and the total in the total column.

The column before the one headed "lock tending," is intended for the entry of lock tending and check rolls for a month, to get at the footing of each for that period, to be carried under the appropriate heads.

The above "form" is intended to show the superintendents how they are to fill up their abstracts to be sent to the Canal Department. It is expected that this "form" will be always used by every superintendent as a guide in making up their abstracts.

STATE OF NEW YORK, CANAL DEPARTMENT, }
ALBANY, 187 . }

To:

SIR.—At a meeting of the Canal Board, held ——, 187 , you were appointed a patrolman, under act, chapter 55, of the Laws of 1870, to be assigned to duty on such portion of the canals as the Commissioner in charge of the —— division may direct, at a salary of —— dollars per month.

Within ten days after the receipt of this notice, you are required to take and subscribe the official oath required by the Constitution of this State, file the same in the office of the clerk of the county in which you reside, and transmit a certified copy thereof to this department.

On the opposite page of this sheet you will find a certified copy of the regulations adopted by the Canal Board, June 16, 1870, in regard to the duties of patrolman. I will also send you a certified copy of the canal laws and regulations.

Yours, etc.,

....., Auditor.

REGULATIONS IN REGARD TO PATROLMEN.

The Commissioner in charge shall assign to each of the patrolmen appointed by the Canal Board such beat or portion of the canal on his division as he shall deem expedient. Such patrolmen shall take the oath of office prescribed by the Constitution of the State, within ten days after notice of appointment, and file the same in the office of the county clerk of the county in which he shall reside, and also in the office of the Auditor, at Albany.

It shall be the duty of such patrolmen to pass over that portion of the canal assigned them daily, and oftener if necessary, to see that the levels are kept at a proper and uniform height; that water is not unnecessarily wasted, or wrongfully taken from the canal; that timely warning is given to the repair agents of leaks or other dangers to the canal; that the locks are well and properly attended; that boats are not overloaded; that boatmen keep their boats moving, and in such shape at all times as not to in any way or manner obstruct the flow of water or navigation.

Every master or person in charge of a boat or float shall obey the orders of the patrolmen as to taking off a part of their cargo, if overloaded; as to keeping their boats or floats in such shape, at all times, as not to obstruct navigation or the flow of

water, and shall move their boats or floats, or moor them, as he shall direct, in order to facilitate navigation and promote the best interest of the State and navigator; but for any willful neglect of these things, or disobedience of the orders of patrolmen with reference thereto, such master or person in charge of a boat or float shall be liable to a fine of from five to ten dollars for each offense, dependent upon the nature of the same, which fine may be laid and collected by such patrolman, and the boat or float detained until such fine be paid. All fines so collected to be paid to the State.

Each patrolman, by virtue of act, chapter 55, of the Laws of 1870, has police powers and authority to arrest and detain offenders for any violation of the rules and regulations of the Canal Board, made and adopted pursuant to law, until the persons or parties so offending shall satisfy the demands of the same.

STATE OF NEW YORK, CANAL DEPARTMENT.

I certify, that I have compared the foregoing regulations with the original regulations, adopted by the Canal Board on the 16th day of June, 1870, and that the same is a true copy thereof, and of the whole of said original regulations.

In witness whereof I have hereunto set my hand and affixed my official seal, this 16th day of June, A. D., 1870.

....., Auditor.

....., 1870.

I hereby certify that , a patrolman, stationed at , on section of canal, has faithfully performed the duties prescribed by the regulations in regard to patrolmen, adopted by the Canal Board June 16, 1870; and rendered such other services on the canal as have been required of him; and that he is justly entitled to pay for days' service in the month of , 1870.

....., Superintendent,
Section of canal.

T A B L E S
OF THE PRINCIPAL PLACES ON THE CANALS, AND
THEIR DISTANCE FROM EACH OTHER.

A LIST of the principal places on the Canals, and their distances from each other, as adopted by the Canal Board.

SERIE CANAL.

NAME OF PLACE.	Bundell's.									
	Lower B. Rock.					Upper B. Rock.				
Adams's Basin.....	274	244	218	187	164	149	108	89	75	57
Albany	7	50	56	87	110	126	106	185	199	217
Albion	286	265	237	206	188	168	127	108	94	76
Annieville	53	46	33	34	57	72	116	132	146	164
Arriesville	172	165	142	115	95	62	47	55	50	45
Belle Isle	940	343	310	293	283	282	163	164	150	182
Black Rock	152	145	126	96	65	42	28	33	47	65
Boltvar	266	239	219	190	169	146	116	90	71	57
Brighton	272	249	226	200	169	146	114	94	80	62
Brockville	288	251	258	222	191	178	154	132	103	89
Brockways	959	229	213	186	159	144	103	84	70	52
Buffalo	352	345	322	296	242	227	186	167	153	185
Bushnell's Basin	241	218	192	161	138	123	82	63	49	31
Cambellus	175	168	145	120	98	75	50	9	10	24
Congofharie	68	61	38	12	19	42	57	98	117	131
Canasota	145	128	115	89	59	35	30	21	40	54
Camaseraga Landing	160	148	130	94	68	40	25	16	35	49
Clinton	180	173	150	124	93	70	55	14	5	19
Cloverdale	250	245	220	194	163	140	125	64	65	51
Chittenango	192	165	142	116	90	62	47	36	7	7
Clyde	161	144	121	95	64	41	26	15	34	48
Cohoes	210	203	180	154	123	100	85	44	25	11
Cold Spring	11	4	1	1	1	1	1	144	155	174
Colony's Basin	186	179	156	130	99	76	59	1	13	13
Crescent	277	270	947	291	190	167	153	111	92	60
Dammarion	114	7	16	47	21	171	165	111	141	153
Durham	195	189	165	132	97	70	56	30	49	63
Durhamville	160	133	110	84	53	30	15	26	45	59
Eagle Harbor	296	269	240	209	186	171	130	111	97	79
East Arealia	220	213	190	164	138	110	95	54	35	31
East Canada Creek	82	75	52	26	5	38	43	84	103	117
Fair Plain	244	237	214	188	157	134	119	78	59	45
Fort Plain	77	64	41	15	16	11	9	54	95	114
Frankfort	101	94	71	45	14	9	5	84	65	84
Fulton's Basin	245	238	215	189	158	135	101	79	60	51
Fultons	160	99	96	76	50	31	19	4	19	60

CANAL COMMISSIONERS.

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game's Basin.....	10	96	15	57
Gaspert.....	10	96	15	57
Geddes.....	112	81	112	37
Greece (six mile grocery).....	143	2	136	164
Hillierville.....	141	100	111	180
Hindburgh.....	10	81	67	86
Hindeburgh.....	156	50	155	82
Holley.....	149	48	97	86
Holman's Ferry.....	149	48	13	217
Holberton.....	170	129	126	63
Illion.....	205	228	116	32
Ilion.....	190	112	81	159
Jordan.....	156	141	117	180
Junction.....	156	141	100	81
Kirkville.....	164	182	67	97
Knappsville.....	179	202	104	90
Knowlesville.....	149	47	145	102
Lenox.....	254	228	177	174
Limestone Feeder.....	280	257	177	163
Little Falls.....	201	111	121	121
Lock Berlin.....	115	152	27	68
Lockport.....	148	125	119	90
Lockville.....	241	211	158	131
Lock No. 65.....	255	224	174	139
Lodi.....	289	269	213	189
Loomis.....	136	113	83	77
Lower Black Rock.....	159	152	129	103
Mabees.....	148	125	99	68
Mahon.....	321	294	211	196
Mallius.....	223	216	197	156
Martinville.....	246	223	166	143
Medina.....	165	158	135	109
Middleport.....	137	130	107	81
Millards.....	348	341	818	510
Mindenville.....	314	307	284	258
Mohawk.....	217	223	197	157
Montezuma.....	158	158	128	109
Newark.....	386	329	306	290
New Boston Landing.....	303	296	273	247
New London.....	309	302	279	253
Nine Mile Creek.....	318	311	282	231
Orangeport.....	78	71	48	22
Oriokau.....	96	88	65	39
Orville Feeder.....	199	192	169	140
Palmrya.....	224	217	194	169
Pendleton.....	149	142	110	83
Peru.....	131	124	101	75
Pickardsville.....	174	167	144	118
Pitt Lock.....	316	309	266	250
Pitford.....	261	244	211	175
Pool Brook.....	154	147	124	98
Port Byron.....	194	187	164	138
Assem. No. 6.]	18	107	84	69

Pine Conal—(Continued).

NAME OF PLACE.	West Troy.	Schenectady.	Fultonville.	Little Falls.	Ditica.	Rome.	Syracuse.	Jordan.	Montezuma.	Lyon's.	Palmira.	Alticon.	Brockport.	Medina.	Lockport.	Tonawanda.	Lowell, B. Rock.	Burnell.	
Port Gibson.....	227	220	197	171	140	117	102	42	39	10	5	32	52	66	76	94	113	121	125
Port Jackson.....	46	39	16	41	64	79	120	139	153	171	156	213	233	247	257	275	294	302	303
Reynolds' Basin.....	313	306	288	257	236	203	188	147	138	114	96	81	34	31	10	8	27	35	39
Rochester.....	2559	2552	2529	263	172	149	134	93	74	60	42	37	30	34	44	62	81	90	93
Rome.....	125	118	95	69	38	15	41	60	74	92	107	134	151	168	178	196	215	223	227
Schenectady.....	30	23	22	26	57	80	15	126	155	169	187	902	220	249	273	291	310	315	323
Schoharie Creek.....	51	44	21	5	56	59	74	115	194	118	165	181	206	228	243	252	270	289	297
Shelby Basin.....	306	299	276	250	219	196	181	140	121	107	89	74	47	27	13	3	15	34	46
Spencerport.....	271	264	241	215	184	161	146	105	86	72	54	39	12	8	7	17	22	23	24
Sprakers.....	65	58	35	9	22	45	60	101	130	134	162	167	194	214	228	238	256	275	287
St. Johnsville.....	76	69	46	30	11	34	49	90	110	133	141	156	183	203	217	227	245	264	276
Sulphur Springs, G. Lock.....	326	319	296	270	259	216	201	160	141	157	109	94	67	47	33	25	5	14	22
Syracuse.....	166	159	136	110	79	56	41	19	33	51	66	93	113	127	137	155	174	182	186
Tionawanda.....	340	323	310	294	283	215	174	155	141	123	108	81	61	47	37	19	8	13	14
Upper Aqueduct.....	26	19	4	9	61	84	99	140	159	173	191	206	223	233	267	277	295	314	323
Utica.....	110	103	80	54	23	15	56	75	89	107	122	149	169	188	211	230	258	283	303
Wayneport.....	2339	2323	209	183	152	126	114	73	54	40	29	7	20	40	54	64	82	101	113
Weedsport.....	190	183	160	134	103	80	65	24	5	9	27	42	69	80	103	113	131	150	163
West Troy.....	7	23	49	80	103	118	159	178	192	210	225	252	273	286	314	323	341	345	345
Whitesboro.....	114	107	84	58	27	4	11	52	118	145	165	183	189	207	226	241	254	273	283
Yatesville.....	62	55	32	6	48	63	104	123	137	155	170	197	217	231	241	256	273	286	299
York Mills.....	113	106	83	67	26	8	12	13	63	73	86	104	119	146	166	180	190	208	227

CHAMPLAIN CANAL.

NAMES OF PLACES.	DISTANCE FROM		
	Place to place.	Albany.	Whitehall.
Albany	0	0	78
West Troy	7	7	66
Junction	0	7	66
Waterford	3	12	61
Mechanicsville	8	20	58
Stillwater village	4	24	49
Bleeker's Basin	2	26	47
Wilbur's Basin	2	28	45
Van Duzen's Landing	5	33	40
Schuyerville	3	35	37
Saratoga Bridge	2	38	36
Fort Miller	3	41	33
Moses Kill	3	44	39
Fort Edward	5	49	24
Glen's Falls feeder	2	51	23
Baker's Basin	1	53	21
Smith's Basin	5	57	16
Port Ann	4	61	12
Comstock's Landing	4	65	8
Whitehall	8	73	0

GLEN'S FALLS FEEDER — (*Champlain Canal*).

NAMES OF PLACES.	Distance from place to place.
Champlain canal	0
Sandy Hill	2
Glen's Falls	3
Head of the feeder	2
Head of the pond	5
From Junction to Whitehall	64
Length of Glen's Falls feeder	12
Length of pond above Troy dam	3
Total	79

CHENANGO CANAL.

NAMES OF PLACES.	DISTANCE FROM				
	Place to place.	Utica.	Hamilton.	Oxford.	Bing- hamton.
Utica	0	0	30	60	97
Road leading from New Hartford to Whitesboro	3	3	27	57	94
Clinton	6	9	21	51	88
Deansville	5	14	16	46	88
Oriekany Falls	5	19	11	41	78
Solsville	3	22	8	38	75
Bonckville	2	24	6	36	73
Peck's Basin	2	26	4	34	71
Hamilton	4	30	0	30	67
Lebanon Factory	2	32	2	28	65
Earlville	4	36	6	24	61
Sherburne	5	41	11	19	56
North Norwich	4	45	15	15	52
Plasterville	2	47	17	13	50
Norwich	4	51	21	9	46
Oxford	9	60	30	0	37
Haynes's Mill	10	70	40	10	27
Greene	4	74	44	12	28
Forks	8	83	52	22	15
Pond Brook	2	84	54	24	18
Port Crane	5	89	59	29	8
Crocker's Mills	1	90	60	30	7
Binghamton	7	97	67	37	0

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OSWEGO CANAL.

NAMES OF PLACES.	DISTANCE FROM		
	Place to place.	Syracuse.	Oswego.
Syracuse	0	0	38
Salina.....	2	2	36
Liverpool.....	3	5	38
Mud Lock.....	2	7	31
Cold Spring.....	1	8	30
New Bridge.....	5	13	25
Three River Point.....	2	15	28
Phoenix	2	17	21
Sweet's Lock	3	20	18
Ox Creek.....	2	23	15
Fulton	4	27	11
Braddock's Rapid.....	4	31	7
Tiffany's Landing.....	4	35	8
High Dam	1	36	2
Oswego	2	38	0

CAYUGA AND SENECA CANAL.

NAMES OF PLACES.	DISTANCE FROM		
	Place to place.	Montezuma.	Geneva.
Montezuma	0	0	21
Seneca River.....	5	5	16
S. Dermont.....	2	7	14
Seneca Falls.....	3	10	11
Chamberlain's Mills.....	2	12	9
Waterloo	2	14	7
Teal's	5	19	2
Geneva.....	2	21	0
Lateral canal to E. Cayuga village, 2 miles.....	2		

CHEMUNG CANAL.

NAMES OF PLACES.	DISTANCE FROM			
	Place to place.	Seneca Lake.	Elmira.	Knoxville.
Seneca Lake.....	0	0	23	33
Havana	4	4	19	29
Millport	6	10	18	23
Horseheads	7	17	6	15
Elmira	6	23	0	22
Knoxville	22	33	23	0
FEEDER. (<i>Chemung Canal.</i>)				
Horseheads.....	0	17	6	16
Miller's Basin.....	7	24	13	9
Dam at Head of Feeder.....	7	31	20	2
Knoxville	2	33	23	0

CROOKED LAKE CANAL.

NAMES OF PLACES.	DISTANCE FROM		
	Place to place.	Seneca Lake.	Crooked Lake.
Dresden.....	0	0	8
Mallory's	0	3	5
Andrews and Ways	2	5	3
Penn Yan	2	7	1
Crooked Lake.....	1	8	0

GENESEE VALLEY CANAL.

NAMES OF PLACES.	DISTANCES FROM.									
	Distance from place to place.	Rochester.	Scottsville.	Mount Morris.	Nunda.	Portageville.	Oramel.	Cuba.	Olean.	Danville.
Rochester	0	0	12	37	51	59	78	93	107	52
Rapids (Lock No. 1)	2	2	10	35	49	57	76	91	105	50
Tone's Basin	4	4	4	29	43	51	70	85	99	44
Scottsville	4	12	0	35	39	47	66	81	95	40
Canawaugus (Avon Road)	20	8	17	31	39	58	73	87	92	32
Sackett's Basin	22	10	15	29	37	56	71	85	90	30
Fowlerville Road	24	12	13	27	35	54	69	83	93	28
Barclay's Mill	26	14	11	25	33	52	67	81	91	26
Tiffardinia	29	17	8	22	30	49	64	78	92	23
Spencer's Basin	30	18	7	21	29	48	63	77	92	22
Tracy's Basin	32	20	5	19	27	46	61	75	90	20
Cuylerville	33	21	4	18	26	45	60	74	91	19
Leicester (Moscow Landing)	34	22	3	17	25	44	59	73	88	18
Genesee River Dam	36	24	1	15	23	42	57	71	86	16
Mount Morris	37	25	0	14	22	41	56	70	85	15
Shaker Settlement	41	29	4	10	18	37	52	66	81	11
Brushville	46	34	9	5	13	32	47	61	76	16
Nunda	51	39	14	0	8	27	42	56	71	21
Messenger's Hollow	53	41	16	2	6	25	40	54	69	23
Genesee Falls (Tunnel Section)	57	45	20	6	2	21	36	50	64	27
Portageville	59	47	22	8	0	19	34	48	62	29
Lock No. 61	64	52	27	13	5	14	29	43	54	34
Mixville Landing (Wiscoy Feeder)	65	53	28	14	6	13	28	42	55	35
Fillmore	69	57	32	18	10	9	24	38	50	39
Burrville	75	63	38	24	16	3	18	32	45	45
Canadada Centre	76	64	39	25	17	2	17	31	46	46
Oramel	78	66	41	27	19	0	15	29	48	48
Belfast	80	68	43	29	21	2	13	27	50	50
Rockville	83	71	46	32	24	5	10	24	33	53
Caseville	84	72	47	33	25	6	9	23	34	54
Black Creek Corners	88	76	51	37	29	10	5	19	33	53
Cuba	93	81	56	42	34	15	0	14	33	63
Ischua Feeder	99	87	63	48	40	21	6	8	69	69
Hinsdale	100	88	63	49	41	22	7	7	70	70
Olean	107	95	70	56	48	29	14	0	77	77
DANVILLE BRANCH.										
Shaker Settlement	0	41	29	4	10	18	37	52	66	11
Fitzhugh's Basin	2	43	31	6	12	20	39	54	68	9
Kyserville	1	44	32	7	13	21	40	55	69	8
Rock Spring	2	46	34	9	15	23	42	57	71	6
Sherwood's Landing	1	47	35	10	16	24	43	58	72	5
Steam Saw Mill	1	48	36	11	17	25	44	59	73	4
McNair's Landing	1	49	37	12	18	26	45	60	74	3
Woodville	1	50	38	13	19	27	46	61	75	2
Cumminsville	1	51	39	14	20	28	47	62	76	1
Danville	1	52	40	15	21	29	48	63	77	0

DANVILLE SIDE CUT—(*Genesee Valley Canal*).

NAMES OF PLACES.	Distance from place to place.
Shaker Settlement (Junction)	0
Fitzhugh's Basin	2
Kyserville	1
Rockspring	3
Sherwood's Landing	1
Steam Saw Mill	1
McNair's Landing	1
Woodville	1
Cumminsville	1
Danville	1

